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THE

CABINET CYCLOPÆDIA.

CABINET CYCLOPEDIA

COMPILED BY

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THE
CABINET CYCLOPÆDIA.

CONDUCTED BY THE
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Natural History.

ON THE
NATURAL HISTORY AND CLASSIFICATION
OF
FISHES, AMPHIBIANS, AND REPTILES.

BY
WILLIAM SWAINSON, A.C.G.
F.R.S. L.S. ETC.

VOL. II.

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"THE EARTH IS FULL OF THY RICHES — SO IS THE GREAT AND WIDE SEA, WHEREIN ARE CREEPING THINGS INNUMERABLE, BOTH SMALL AND GREAT BEASTS.

— "THESE WAIT ALL UPON THEE, THAT THOU MAYEST GIVE THEM THEIR FOOD IN DUE SEASON."

PSALM CIV. 25. 27.

THE NATURAL HISTORY
OF
FISHES, AMPHIBIANS, & REPTILES,
OR
MONOCARDIAN ANIMALS.

By William Swainson, F.R.S. &c.

IN TWO VOLUMES.



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NATURAL HISTORY
AND
CLASSIFICATION
OF
MONOCARDIAN ANIMALS.
VOL. II.

PART I.

ON THE ACANTHOPTERYGES, OR SPINE-RAYED ORDER
OF FISHES.

CHAPTER I.

ON THE VARIOUS TRIBES COMPOSING THIS ORDER, AND THEIR
NATURAL RELATION TO OTHERS.

(1.) THE order of fishes with which we commence this volume is more numerous in its contents than those of all the others put together of this class of animals. This inequality, at first sight, may appear at variance with that proportion which nature preserves in her great divisions; yet it will be found, on more attentive consideration, that it is only another proof of the

harmony and consistency of that system upon which the variation of animal structure has been regulated. The vast assemblage of fishes comprised under this order are considered by all authors, and justly, as the most perfect, or pre-eminently typical, of the whole class; that is to say, they are the most highly organised of all fishes, just as the *Insessores*, or the perchers, are among birds. Every naturalist is aware that typical groups are always large, and that aberrant ones are small: the one shows us the rule, the other the exceptions: the former may be compared to the broad surface of a wide extending region, where all its peculiarities of climate, scenery, and productions are seen in their full development; the latter are analogous to the borders of this region, where some of the characteristics of the interior districts are but faintly, and others not at all, discerned: they become, in short, commingled with those of the neighbouring provinces; and although these districts still retain sufficient of their national characteristics to show to which region they truly belong, their limits are yet confined, and their general features but faintly represent the typical peculiarities of the region to which they naturally pertain. Every one of our readers is aware of the truth of this in regard to physical geography; and the philosophic naturalist knows that it is equally so in natural groups of animals. It may safely be pronounced a law of nature, that whatsoever is most perfect in its kind, or in other words *typical*, should be most numerous, and that the deviations from this perfection should be few: these deviations, in fact, are but stepping-stones or porticos connecting a series of long galleries or lofty halls — they are the graduated links in the chain of Nature, by which all her productions, nay, all her operations, acquire that uniformity and harmony everywhere discernible. Applying all this to the case before us, we need feel no surprise at the superiority, in every respect, of the order of spine-rayed fishes, over all others.



Among these we shall find all those genera which are most complex or perfect in structure, most elegant in form, or most beautiful in colours: they are, in short, the perfection of the class of FISHES, just as the perching order shows us the perfection of birds; and thus the analogy between the two becomes established upon the most solid and indisputable grounds.

(2.) The chief peculiarities of this order, in regard to general structure, have already been slightly noticed, but they will now be briefly recapitulated. In the first place, the skeletons of all are perfectly osseous, the branchial aperture of their gills fully open*, and the anterior dorsal rays composed of simple spines. Of these three characters, the first is absolute, the second all but absolute, and the third offers but very few exceptions.† To these we might almost add a fourth, as distinguishing them from the malacopterygious order, which is, that it is among these we find all those osseous fishes which have two dorsal fins, each supported by distinct rays. This character, however, is not of so decisive a nature as the three former, because all the *Gadidæ*, or cods, have two, and many of them three dorsal fins. And yet it is very remarkable that this exception should only be found in that group which connects the spine-rayed with the soft-rayed orders,—a fact which shows that the fourth character is really a natural one, although less absolute than the three former. It must not be supposed, however, that the *Acanthopteryges* are all distinguished by two dorsal fins, as the *Malacopteryges* are by having only one‡: on the contrary, not more than one half may be said to have this fin distinctly divided into two, although in a very large num-

* Some few exceptions to this are found among the *Blennides*, which connects this order with the apodal, or eel-like fishes.

† As in *Ophiocephalus*, where the rays are soft and branched; the *Blennidæ*, where they are soft and simple; and one or two other instances occur in the aberrant groups.

‡ When a second dorsal fin occurs in this class, as in the *Salmonidæ* and *Siluridæ*, this fin is adipose, or without rays, as if in an incipient state: in the *Gadidæ* alone, the rays are developed.

ber it is deeply cleft in the middle ; and even in such as have it continuous, it frequently happens that there are a few detached spines, with or without a membrane, which may be said to represent the first dorsal. In other respects there is to be found, in this order, a much greater variation in the form and construction of the dorsal fin than in that of the *Malacopteryges* : in this latter there are no instances of some of the hinder rays being separated into finlets, as in the *Scomberidæ* ; or the anterior rays prolonged into several slender filaments, as in the *Zeidæ*, or dories ; or the dorsal so elevated as to act as a sail, as we see in some of the sword-fish (*Xiphidæ*) ; not to mention several minor modifications of this fin which are altogether peculiar to the present order. Finally, we may remark, as another of the secondary characters by which the two orders are separated, that in none of the soft-rayed genera are the dorsals partly covered with scales,—a structure which is very prevalent in many of these hereafter described ; for although the fins of the *Gadidæ* are thick and fleshy, they do not appear to be covered by a continuation of the scales of the body, as those of the *Chætodonidæ* and their numerous representatives.

(3.) On the natural history, properly so called, of the spine-rayed tribes we can say but little, and that little must be of a general nature. Beautiful and interesting as they are, either by their form, or colours, or uses, the inaccessible haunts they frequent, impenetrable to the eye of man, effectually shrouds the history of their habits and economy from our research ; while, to be merely told that such and such a fish is good for food, when dressed in such and such a way, has ever appeared to us trifling and unnecessary. We have never met with a fish which was *not* good for food ; for although, after one trial, we could not eat young sharks or frog-fish (*Chironectidæ*), the former are relished by the Sicilians, and the latter, as we are told, are eaten by the negroes of Pernambuco. There is, undoubtedly, a

great variation in the flavour of fishes, as in that of other animals; but nearly all the acanthopterygious tribes appear edible, although many are vastly superior to others.* The whole of the mackerel (*Scomberidæ*), the tunnies, the dories (*Zeidæ*), together with the perches, mullets, gurnards (*Triglidæ*), chætodons (*Chætodonidæ*), and some others, are the finest flavoured in the order; and many of them may even rank with the most esteemed of the soft-rayed division: or the salmon, herring, flat fish, &c. The flavour of the tunny, indeed, has nearly as much resemblance to that of flesh as to fish; and to those who have tasted it, we need not expatiate upon its excellence: when fried in the form of cutlets, it has the strongest resemblance to veal, having the same compact firmness, and the same delicate whiteness. The *Gymneres*, or riband-fish, are so exceedingly thin, that they afford no substance for food, except indeed the *Cepolæ*, which, at certain seasons, are abundant in some parts of the Mediterranean, and are by no means ill-flavoured. The sandlances (*Ammodytes*), by some singular prejudice, are seldom, if ever, eaten in this country; but we can give our testimony to the good taste of the Sicilians, who reckon them, when fried, among their most delicious fishes. Among the *Canthileptes* there are only the gurnards which are held in any esteem, except by the poor; for they are in general somewhat coarse. The whole of the gobies and blennies, on the other hand, are much too small for cooking, except in messes for the poorer people in Italy, where they are found in abundance. It is very remarkable that all the most esteemed fish for the table, in the order before us, should belong only to its two typical divisions, hereafter characterised under the names of *Macroleptes* and *Microleptes*; the first including the perches, the second the mackerel: in none of the aberrant tribes are there any species of importance as food, either in point of numbers, size, or

* The fishes of the genus *Synanchia*, which represent the *Chironectidæ*, are said to be as disgusting for food, as they are in their aspect.

flavour, except indeed the lances (*Ammodytes*), already spoken of. The fisheries of the tunny and sword-fish are as important to the South of Europe as that of the herrings and cods are to the northern countries: the capture of the mackerel, also, employs a large number of men, and a considerable amount of capital; and the abundant supply thus brought to market gives a cheap and wholesome food to thousands. With these exceptions, however, the present order must yield, in point of absolute utility, to that of the soft-rayed tribes, where the salmon, cod, herring, and pilchard fisheries probably supply food to one fifth of the habitable globe.

(4.) There is nothing peculiar in the geographic distribution of this class, when viewed collectively, for the different tribes occur in all seas, and in all latitudes; nevertheless, when we descend to particulars, we shall find that a marked distinction is often presented between those which respectively inhabit temperate, tropical, or arctic latitudes. With the exception of a very few genera, the whole are strictly marine fishes, whereas the largest proportion of the soft-rayed order are fluviatile: there is reason to believe, also, that the two are further marked by this peculiarity, that while there are many of the soft-rayed order which feed upon vegetables, the whole of the present division are entirely carnivorous. As these are the only general observations which can be applied to a group so much diversified as that now before us, we shall at once proceed to characterise its component parts.

(5.) We arrange this most extensive order under five primary divisions or tribes, to which we give the following names and characters:—1. The **MACROLEPTES**, which include the perches, the chætodons, and numerous other groups, having the gills, on one or more parts, armed with spines or prickles; the scales comparatively large, well defined, and almost always smooth; while the bones of the head, and all the fins, are in an ordinary state of development.—2. The **MICROLEPTES**, or small-scaled tribe, at the head of which stand the two

great families of *Scomberidæ* and *Zeidæ*, or the mackerel and dories. These, in contra-distinction to the last, have the scales in general remarkably small—often, indeed, almost invisible: the bones of the head and gills are of the ordinary structure; but the latter are rarely, if ever, defended by spines: the body is smooth, but the back is often armed with prickles, and the dorsal fins are sometimes singularly developed.—3. The GYMNETRES, represented by the genus *Gymnetrus* of Bloch, includes also that of *Cepola*, and all those which have been aptly denominated riband-fishes, from the excessive thinness and disproportionate length of their bodies: like the last tribe, the scales are very small, often imperceptible, and the whole structure altogether peculiar.—4. The CANTHILEPTES, or mailed cheeks (called by Cuvier *Buccæ Loricatæ*), have the bones of the head greatly developed, and generally terminating in large spines: the scales are small in the typical examples, and rough or prickly: the pectoral fins highly developed, and the gill opening much contracted.—5th, and lastly, come the BLENNIDES, or blennies, known at once by the flexibility of their dorsal rays, the slimy nature of their bodies, the peculiar forms assumed by the ventral fins, and, lastly, the viviparous nature of their generation.

(6.) The affinities by which the foregoing tribes are connected into one great circular group, will be enlarged upon when we come to treat of each in detail. It is easy for the ichthyologist to perceive that the two first—the *Macroleptes* and the *Microleptes*—comprehend the most highly organised fishes in existence, and that they consequently become the typical tribes. The three others, far less numerous in species, will therefore be aberrant: they show, indeed, enough of the typical characters of the order to make us include them therein; but in other respects they partake so much of the peculiarities belonging to other tribes, that we plainly perceive they only form connecting links between the pri-

mary series into which the whole class has been distributed.

(7.) That the tribes we have just enumerated show a marked analogical resemblance to those which compose the *Malacopteryges*, or soft-rayed order, will be abundantly evident when we come to place the two series in juxtaposition, as in the following table:—

Analogies of the ACANTHOPTERYGIOUS and the MALACOPTERYGIOUS Orders.

Tribes of the <i>Acanthopteryges</i> .	Analogical Characters.	Tribes of the <i>Malacopteryges</i> .
MACROLEPTES.	{ Body lengthened, ovate, covered with distinct scales; dorsal fins two.	SALMONIDÆ.
MICROLEPTES.	{ Body short, compressed, broad; scales very small; dorsal fins one.	PLEURONECTIDÆ.
GYMETRES.	{ Body long; scales minute, hid under the skin; ventrals sometimes wanting.	GADIDÆ.
CANTHILEPTES.	{ Head loricated, the bones highly developed; scales often spinous.	SILURIDÆ.
BLENNIDES.	{ Small; dorsal rays soft; viviparous.	COBITIDÆ.

A detailed illustration of these comparisons, which we shall now enter upon, will be of much interest to the experienced zoologist, and will give the student a further insight into the several peculiarities of the groups thus brought together. We have shown, in a former volume, that the salmon tribe are the most perfectly organised of the soft-rayed division of osseous fishes; and Cuvier's opinion, that the *Percidæ* (the types of the *Macroleptes*) should be placed at the head of the spine-rayed order, is confirmed in its correctness by the result of our researches. In these two groups, typical of their respective orders, we find those genera which are most distinguished for possessing two dorsal fins—witness the whole of the *Salmonidæ*,

or salmons, and the greater part of the true perches. The shape of both these groups is that of a long oval, moderately thick, without any extraordinary development of any one part or member. These characters, however, do not apply to the two next groups, namely, the *Microleptes* and the *Pleuronectidæ*: here the scales are invariably very small, and often excessively minute. When we consider the shape of the *Zeidæ*, or dories (one of the types of the *Microleptes*), we may justly pronounce them the flat fish of the acanthopterygious order; both are short and excessively broad fish; both have the scales very minute; and both stand as the sub-typical divisions of their respective orders. The *Zeidæ*, in fact, are the shortest and most compressed fish of the *Microleptes*, just as the *Pleuronectidæ* are of the *Mala-copteryges*. Passing from these, we come to the *Gymnetres*, or ribband-fish, which stand opposite, in our table, to the *Gadidæ*, or cods. That these two groups are not only analogous, but actually pass into each other, is completely proved on looking to the genera *Cepola* and *Ophidium* in the first, and to *Physis* and *Raniceps* in the second. In both we find the dorsal fin excessively long, composed of numerous slender rays; and the ventrals singularly varied, by being either very small and filiform, or altogether wanting: the scales likewise are minute, scarcely perceptible, and seem imbedded in the common skin of the body, which, from being generally extended over the dorsals, renders those fins very thick. Here, likewise, the spiny rays of the two former tribes disappear, and are exchanged for others, which, if not flexible, as in *Ammodytes*, *Ophidium*, *Cepola*, and all the *Gadidæ*, are always very slender and brittle. The *Gymnetres*, in fact, have lost the distinguishing character of the *Acanthopteryges*, and thus become as truly soft-rayed fishes as any of the *Gadidæ*. The resemblance between the *Canthileptes* and the *Siluridæ* is perhaps stronger than that of any two groups in the whole table: both are the only families where the head and cheeks are covered with bony

plates ; or, in other words, they are more or less mailed : in both do we find instances where the first dorsal ray is not only spinous, but armed with prickles on its anterior edge : in both the eyes are small, and placed close to each other, towards the top of the head ; and in both is its inferior surface considerably flattened : the analogy, in fact, cannot be stronger ; so that, whatever disposition may be made hereafter of the other groups, no arrangement which does not preserve this most beautiful relation of the *Canthileptes* to the *Siluridæ*, can possibly be natural. We look to this, therefore, as the strongest collateral proof of the general correctness of our arrangement, because this arrangement is founded upon relations of affinity ; that is, by tracing the series of groups in all their details : and yet, after having done so, we find that this series of affinity brings to light another series of analogy, even more beautifully harmonious than the first, inasmuch as it adds another instance to that general system of representation which pervades the whole of these vertebrated groups contained in our former volumes. As we shall have occasion, hereafter, to illustrate this part of our present exposition in more detail, we may pass on to the relations between the *Blennidæ* and the *Cobitidæ*, two singular groups of small-sized fishes, remarkable for being altogether viviparous, and in having the branchial aperture very much contracted, although not sufficiently so as to constitute them spiraculated fishes, like the eels. That the blennies and gobies, of all the acanthopterygious order, make the nearest approach to the eels, is sufficiently evident when we look to the *Anarrhicas*, where the ventral fins disappear, and the dorsal, anal, and caudal fins are united : and yet M. Cuvier very justly observes, that these eel-like fishes may be called blennies without ventrals. The loaches, again, are so closely allied to the *Salmonidæ*, by means of the carp (*Cyprininae*), that Cuvier places them in the same family ; from which, however, they differ most essentially, in being viviparous. We revert to these relations of affinity, because the absolute connec-

tion between the *Cobitidæ* and the *Siluridæ* remains to be discovered: they certainly, however, appear to have no immediate connection with the *Esocinæ*, or pikes, although such is the station assigned to them in the *Règne Animal*.

(8.) It is almost unnecessary in this place to compare the tribes of the *Acanthopteryges* with the orders of the whole class, because, as these latter have already been traced in the divisions of the *Malacopteryges*, it necessarily follows from the results in our last table, that the tribes of the present order have precisely the same relations. We shall, however, place them before the reader in a distinct table, not only because he will thus have them immediately beneath his eye, but because some very remarkable similarities, not yet alluded to, will be elicited by the comparison.

Analogies of the ACANTHOPTERYGES to the Orders of Fishes.

Tribes.	Analogies.	Orders.
MACROLEPTES.	{ The most typical of their re- spective groups.	ACANTHOPTERYGES.
MICROLEPTES.	Sub-typical. Scales in general small.	MALACOPTERYGES.
GYMNETRES.	{ Body narrow, excessively long ; ventral fins often wanting.	APODES.
CANTHILEPTES.	{ Body more or less mailed ; mouth small ; eyes vertical.	PLECTOGNATHES.
BLENNIDES.	{ Rays of the fins flexible ; head depressed ; viviparous.	CARTILAGINES.

The typical and sub-typical groups in these columns need not detain us, for it has already been seen that they constitute the two most perfect divisions in each: we shall therefore merely glance at the three last, or the aberrant divisions. The whole of the *Gymnetres*, or riband-fish, may be called the eels of the spine-rayed order; for although, as their name implies, they are compressed instead of cylindrical, yet the excessive length and slenderness of their bodies, their long dorsal fins, and the frequent absence of the ventrals (as in the

genera *Lepidotus*, *Trichiurus*, *Ammodytes*, *Ophidium*, &c.), all conspire to evince their analogy to the apodal order. The most hideous fishes in creation are the *Scorpeninæ* (as the genera *Synancia*, *Pelor*, &c.), and the *Chironectes*, or frog-fish, the first being part of the typical *Canthileptes*, and the latter of the *Plectognathes*; while, if we wish to see this analogy more conspicuously worked out, we have only to look to the mailed groups of the *Triglidæ* in one, and the *Balistidæ* in the other. Lastly, we have the flexible rays of the fins, and the viviparous nature of the sharks, represented in the *Blennides*,—characters which are not found in any other of the typical osseous fishes.

(9.) In placing these analogies before the reader in the present stage of our inquiry, we have anticipated the results which come out of the subsequent exposition of the series of affinity. We hope, therefore, he will understand this, and not suppose, as some of our young disciples have done, that in this and other of our tables, those groups are put opposite each other which have the greatest similitude, without a due regard to the order in which the divisions of each column follow in the order of affinity. This is so far from being the case, that each of these groups have been previously analysed almost down to the sub-generic types of form; and this will be rendered apparent not only in the following chapters, but much more so in the scientific arrangement of the class at the end of the volume.

CHAP. II.

ON THE MACROLEPTES, OR TYPICAL TRIBE OF THE ORDER OF
SPINE-RAYED FISHES.

(10.) WE commence with the typical group. When it is considered that this vast order includes more than all the other divisions of the class put together, it becomes obvious that our space will only permit a very partial illustration of their relations, in addition to the ample details which will be found in our general arrangement of the class in another portion of the volume; and, indeed, we shall be obliged, in some instances, to give no more than analogical tables of several important groups. The labour bestowed, however, upon the natural arrangement of the whole, will, we hope, compensate for this necessary brevity. We have found this tribe, in fact, the most difficult to analyse, next to the *Squalidæ*, of any in the entire class. Cuvier has confessed this, and no better authority can be quoted in support of our own opinion than that of so eminent an ichthyologist. It is almost needless to say, that for many years the natural arrangement of these groups have engaged much of our attention, because that will be apparent in the numerous genera and sub-genera now first characterised, no less than in the analogical tables which are so thickly scattered throughout this volume. It is in these comparisons that, as we have been assured, so many of our readers, ignorant of systematic zoology, feel interested; nor can we feel any surprise that general views are more interesting to such persons than those dry technicalities with which the naturalist is

alone interested: we only regret, that having to adapt our volumes to both classes of readers, we cannot give more to the one and less to the other, without an infringement of that plan upon which the Cabinet of Natural History was originally formed. That all the laws of animal variation which have been shown to pervade the classes of quadrupeds and birds, are equally apparent in that of fishes, will, however, be abundantly proved: indeed, so far as our own opinion is concerned, we think they are more manifested in this little known class of animals than in any other of the vertebrated circle.

(11.) Having already stated the general characters by which we distinguish the tribes, we may at once take a rapid survey of the minor divisions, or what appear to be the natural families of the *Macroleptes*. The first of these are the *Percidæ*, or perches, where the form is oval-oblong: the plates of the *operculum*, or gills, are armed with minute serrated teeth or distinct spines: the jaws are without grinding teeth; the fins almost always destitute of scales; and the dorsal either double or deeply cleft in the middle.—2. The *Chætodonidæ*, or chætodons, where the body is short and broad; the fins generally covered for one half of their breadth with small scales; the dorsal fin usually single; and the jaws often provided both with bristle-like teeth and with grinding teeth. These two constitute the typical families; they comprise a great number of minor variations, and a vast assemblage of species. In the three aberrant types we arrange, 1. the *Mugillidæ*, or mullets, where the head is very small, greatly depressed on the crown; the body nearly cylindrical; and the snout or muzzle projecting beyond a little mouth, which is placed beneath.—2. The *Mullidæ*, or sur-mullets, whose head is large, high, and much compressed; the eyes placed close together near the crown; and the under jaw furnished with barbels.—3. The *Spirobranchidæ*, whose body, in comparison to the tail, is

excessively short, so that the vent is close to the pectoral fin. This peculiarity, joined to a very long ventral, assimilates them to the apodal order. Each of these divisions are represented by the following well-known fishes:—the common perch; the chætodon; the common grey mullet; the surmullet; and the *Ophiocephalus*.

(12.) The above families appear to form a circular group, which may be traced in the following manner. Commencing with the *Percidæ* with spined opercula, we pass through *Holocentrus* to *Percis*, — a singular genus, which, by its fleshy lips and nearly smooth gills, prepares us for the *Labridæ*, which thus connect the *Percidæ* and the *Chætodonidæ*. By means of *Clepticus* and *Gerres*, we pass to *Chætodon* and *Holocanthus*, the two most perfect groups of their family. *Diplerodon* and *Ephippus* lead us to the *Sciæninæ*; and these, again, to the *Sparidæ*. Many of these latter genera show an evident affinity to the mullets: in this small family we also include the genus *Polynemus*, which, in all but its pectoral processes, is but a slight modification of the form of *Mugil*. The surmullets (*Mullus*) appear to follow these; and we again return to the *Percidæ* by means of the *Spirobranchidæ*, where the genera *Datnia*, *Helotes*, and *Pelates* of Cuvier, blend into the perches in the most gradual manner. Before exhibiting the analogies which this great circle presents to others, we shall take a short survey of each of the families; the scientific or technical details of which will be found at large in the systematic arrangement.

(13.) The *Percidæ*, or perches, is the only group in this tribe which contains species inhabiting fresh waters, of which the common perch is a well-known example; the great majority being marine: with a very few exceptions, they are all oblong fishes, having the membranes of their fins sub-transparent, and destitute of scales towards the base. In all these characters they differ essentially from the next family, or the *Chætodonidæ*, whose

body is short and broad : their most essential distinction, however, from these latter (which are much diversified in the aberrant examples) is to be found in the finely crenated margin of the operculum, and the isolated spines upon the pre-opercule : sometimes both these characters exist in the same genus ; while in others there is only one. The teeth are variable ; but they are generally small, sharp, and detached ; usually situated not only in the jaws, but also on the vomer and palatine bones : the ventral fins are always perfect, of ordinary dimensions and structure ; and they are placed under the pectorals. There is nothing, in short, in the development of any part of these fishes, which gives a preponderance of power to any one part, and a corresponding weakness or diminution to another. They are perfectly-shaped fishes, with the two dorsal fins either very distinct, or slightly connected. The number of rays in the gill membrane is generally seven ; but this character, to which so much importance has been attached, we consider as of a very secondary nature. We arrange the whole of this group under five sub-families ; the names of which, as usual, are taken from the genera which appear to be the types ; viz. — 1. *Percinæ* ; 2. *Serraninæ* ; 3. *Percophinæ* ; 4. *Holocentrinæ* ; and 5. *Helotinaæ*. We shall only notice the genera of the first of these, as that will be sufficient to give the reader an insight into the principles of arrangement, according to the natural affinities, which have guided us in all the others.

(14.) The *Percinæ*, or true perches, have the two dorsal fins generally separated : the membrane which connects the rays is semi-transparent, and slightly, if at all, coloured, as in the beautiful group which next succeeds, namely, the *Serraninæ*. The form of the body in the perches is oblong ; the scales comparatively large, but without extending over the dorsal fins : the pectorals and ventrals are obtuse, and somewhat rounded ; the mouth large, and furnished with short, small, and

crowded teeth ; but without any canines, or larger teeth on the sides. The leading divisions or genera of this group appear to be the following. The most typical, which is that of *Perca*, has all the characters, strictly so termed, which we have just detailed ; with only such slight variations in the sub-genera, as serve to indicate the primary types of the class which they are intended to represent: thus in *Lates C.* the tail or caudal fin is rounded, although in every other respect it is a true *Perca*. In *Diplopteron* the body is so broad, and the head so high, that it might be mistaken for a chætodon: the pectoral and caudal fins are rounded ; but the ventral is long and pointed. This sub-genus has an evident relation to *Pentaceros*, in the next sub-family. In *Lucioperca*, as the name implies, we see a perch assuming the aspect of a pike ; so that, even in the range of a single genus, such strong resemblances of analogy force themselves on our attention, that we hesitate not to believe their real import.

(15.) The genus *Enoplosus* follows that of *Perca*. It is perhaps one of the most extraordinary in the whole of this family, and is at present represented only by a single species of the Australian seas, first made known by White * : it may be questioned, however, whether that described and figured by Cuvier is not, in reality, a different species. All writers before Cuvier had placed it with the chætodons, which it exactly resembles in its broad and short body, small mouth, and delicate teeth ; yet the fins are naked, the cheek bones spined, and it possesses all the other characters of the true perches. Now here is as perfect an instance of *representation* as can possibly be exhibited ;—an instance, in fact, which will come home to the comprehension of every one who compares its figure with that of a true chætodon : such facts as these (and they start before us at every step of our progress) carry immediate conviction to every unprejudiced mind.

* Voyage to New South Wales, pl. 39. f. 1. Chætodon armatus Shaw.

(16.) The third genus of the *Percinæ* is represented by such fish as the *Aspro* of Cuvier, where the form is more slender and elongated than in the true perch, the head very much depressed, and the muzzle decidedly advanced beyond the under jaw. It is easy to recognise, in this form, a representation of the *cartilaginous* type, and of the *Mugilidæ*: the ventral fins are much developed, and are longer than the pectorals,—a structure which also reminds us of the *Gobianæ*, or gobies. The fourth genus is of the chironectiform type, and is admirably represented by *Huro*. Its very wide mouth opens in an obliquely vertical direction; the under jaw is longest; and the first dorsal fin, as in *Uranoscopus* and *Trachinus* (also chironectiform types), is very small. The last generic group we place in this sub-family is composed of *Pomatomus* and *Apogon*,—both remarkable for their excessively large eyes and thick head: the scales are particularly large, and very deciduous: in both the teeth are minute and velvety; and both appear confined to the Mediterranean and Red Seas. It will be observed, that in *Apogon* the ventral fin, like that of *Ambassus* (which seems the chironectiform type of this genus), is before the pectoral, whereas in *Pomatomus* it is beneath. It is therefore under the belief that *Ambassus* connects *Huro* with *Apogon*, that we have placed it in the present group; while the entire structure of the sub-genus *Cheilodipterus* so beautifully unites those of *Apogon* and *Lucioperca*, that we are almost at a loss to determine into which of the genera it enters. We thus return to the genus from whence we commenced; and we find the sub-family of *Percinæ* constitutes a circle, of which the following table expresses the component parts and the analogies:—

Analogies of the PERCINÆ, or Typical Perches.

Genera of the PERCINÆ.	Analogies.	Families of the MACROLEPTES.
<i>Perca.</i>	Body oblong; mouth large.	PERCIDÆ.
<i>Enoplosus.</i>	{ Body short, broad; mouth very small. }	CHÆTODONIDÆ.

<i>Aspro.</i>	{ Muzzle broad and advanced; mouth small, placed beneath. }	MUGILIDÆ.
<i>Huro.</i>	{ Head deep, broad; eyes near the crown. }	MULLIDÆ.
<i>Apogon.</i>	{ Belly very short; tail long; scales large. }	SPIROBRANCHIDÆ.

In regard to the analogy between *Huro* and *Mullus*, it can only be rendered equally clear with the others by looking to the other types, of which both are diversified representatives: thus, if we compared the above series of genera with the orders of fishes, *Huro* would come in precisely opposite the *Plectognathes*, wherein we have the frog-fish, whose mouth is formed on the same general plan. The whole of the other analogies are so clear, and they follow each other so harmoniously, that we need not enter into any further explanation of them.

(17.) Such are the principles upon which we have analysed and arranged nearly the whole of the immense tribe of the *Acanthopteryges*, or spiny-finned fishes; and were we not straitened for space, we should be able to lay before the reader similar results to those we have just detailed, in almost every group, down to the succession of the sub-genera. Every professed ichthyologist, indeed, will be able to do this himself; for as the different groups and types are all placed in our systematic arrangement in conformity with these principles, so, upon comparing their contents, and studying the principle of variation, he will be at no loss to discover all the analogical resemblances we have just seen, as exhibited in the typical perches: they are, in fact, but a repetition of the very same types differently modified: our notices, therefore, of the remaining groups of this tribe must be more than usually brief.

(18.) The *Serraninæ* is the second, or sub-typical, division of the *Percidæ*; even more numerous in species, and far more beautiful in their colours. They are all marine, abounding in the seas of warm latitudes, but very rarely straying so far north as Britain: only one

example, indeed, of the *Serranus cabrilla*, common in Sicily, has hitherto been found in Cornwall. Their colours are very beautiful, being generally varied with dark bands and bright spots. Their most obvious distinction from the perches is in having but a single dorsal fin; and most have a canine tooth on each side. In the typical genus *Serranus* we have succeeded, as we believe, in determining all the five sub-genera. So beautifully, indeed, do the contents of this sub-family represent those of the last, that it might almost be said every species finds its prototype. If we merely place the genera of the two groups together, their analogies are most complete.

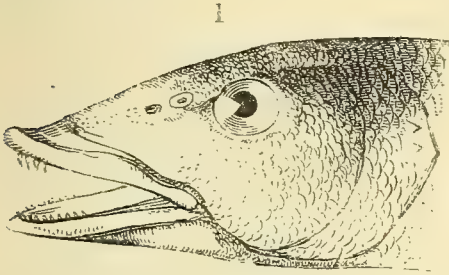
Analogies of the PERCINÆ and the SERRANINÆ.

Genera of PERCINÆ.	<i>Analogies.</i>	Genera of the SERRANINÆ.
PERCA.	{ Body oblong, or ovate; mouth horizontal, large.	SERRANUS.
ENOPLOSUS.	{ Body short, roundish; mouth small.	PENTACEROS.
ASPRO.	{ Muzzle broad, projecting over the lower jaw.	ACERINA.
HURO.	{ Mouth sub-vertical, large; low- er jaw longest.	GRYSTES.
APOGON.	{ Tail much developed; eyes re- markably large.	ETELIS.

(19.) Again, on looking to the sub-genera of the two typical divisions, *Perca* and *Serranus*, the analogies are no less extraordinary.

Sub-genera of the genus PERCA.	<i>Analogies.</i>	Sub-genera of the genus SERRANUS.
<i>Perca</i> Cuv.	{ Pre-eminently typical; caudal fin forked.	<i>Serranus</i> Cuv.
<i>Lates</i> Cuv.	Body broad; caudal fin rounded.	<i>Chromileptes</i> Sw.
<i>Centropomus</i> Cuv.	Anal spines very large	<i>Plectropoma</i> Cuv.
<i>Nippon</i> Cuv.	Lower jaw considerably longest.	<i>Cynichthys</i> Sw.
<i>Lucioperca</i> Cuv.	{ Tail greatly forked; eyes very large.	<i>Variola</i> Sw.

Leaving these, we pass on to the three aberrant sub-families of the perches, viz. the *Percophinæ*, the *Holocentrinæ*, and the *Helotinæ*, in which few species, comparatively, are contained. The first are remarkable for their elongated shape, and for having, unlike all the other perches, the ventral fins placed almost always before the pectorals. In their pointed head and thickened



lips (*fig. 1.*) they so much resemble the *Labridæ*, that we are left in no doubt as to the means by which that charming family is connected to the perches. In the large, vertically cleft mouth of *Priacanthus* we

have a repetition of the chironectiform type — while by *Centropristis* we immediately enter into the next sub-family.

(20.) The *Holocentrinæ*, or mailed-perches, are a small but most beautiful group of fishes; the greater number of the species, and most of the typical, being of different shades of red, from a splendid crimson to a golden yellow. Many types scattered in other groups we have here brought together, and we suspect that several others naturally belong to this division. They are all covered with hard and generally serrated scales; while, in the pre-eminent types (as *Trachichthys*, *Monocentrus*, and *Hoplostethus*), the body is as completely mailed as in the loricated silures (*Loricarinæ*). The true *Anthias* of the ancients (*Serranus Anthias* Cuv.) connects these fishes with *Centropristis*; while that most singular little fish, the *Oriosoma* of Cuvier, shows us the counterpart of *Huro*, *Grystes*, and all the other oblique-mouthed chironectiform types. *Beryx*, with its enormous eyes, finds its prototype in *Apogon*; so that we have precisely the same circular succession, and the same modified forms, as in the *Percinæ* and the *Serraninæ*. Nearly all these are fishes of tropical climates, and not even one can be

cited as a native example. The whole form a group representing the *Canthileptes*, the *Siluridæ*, the *Plectognathes*, and the tortoises, or chelonian reptiles.

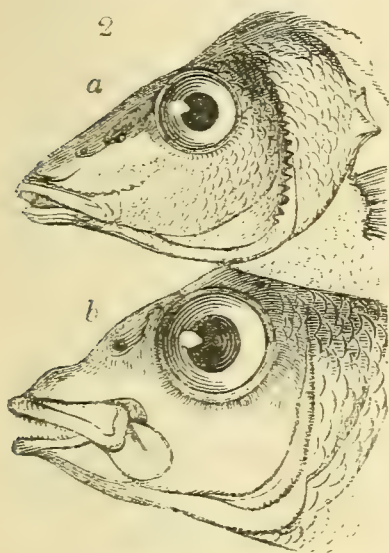
(21.) The last sub-family of the *Helotinæ*, although small and unattractive in appearance, is one of the most singularly interesting groups in the whole family. Cuvier has said of these, that “they constitute a group formed, as it were, to make naturalists despair, by showing how Nature laughs at what we deem characteristic combinations. The genera *Therapon*, *Datnia*, *Pelates*, and *Helotes*, possessing a multitude of mutual relations, as well interior as exterior, sufficient to forbid their distant separation, and bearing a great resemblance to the entire percoid family, at the same time combine species furnished with palatine teeth, along with other species which seem to be constantly deprived of these organs ; they also possess close-set teeth in the jaws, and dentations on the suborbital, the pre-opercles, and not unfrequently on the shoulder bone, while none have more than six branchial rays : no scales are visible on the cranium, muzzle, or maxillæ ; the dorsal spines are folded back into a groove of the back, and the swimming bladder is constantly divided by a restriction into two distinct sacks, as in *Cyprinus*, *Choracinus*, and *Myripristis*.” We have given this passage entire, that we may quote it in support of our own arrangement. In regard to the facts thus elicited no difference of opinion can arise ; but our inferences are totally different from those of the learned author : the very circumstance of these fishes not exhibiting in all instances the typical character, as to teeth, of the perches, clearly shows that they stand at the confines of the family ; while the resemblance they bear — according to Cuvier’s own showing — to *Myripristis*, and consequently to the *Holocentrinæ* in general, as clearly shows, in our opinion, that they are as equally related to them. So far, therefore, from these genera exciting our “despair” at their seemingly discordant characters, we should have been utterly at a loss to complete the circle of the *Percidæ* without them ; for none but these — by

connecting the *Holocentrinæ* with the *Percidæ*—would bring us back again to the last; or, in other words, would complete the circle which the above remarks of Cuvier place beyond doubt. Nature, indeed, will ever laugh, as it were, at our attempts to circumscribe her groups by absolute characters of our own invention; but she almost invariably points out her own course, if we are sufficiently humble and unprejudiced to follow it.

The external analogies of the *Helotinæ* are no less interesting than their affinities: they obviously represent the *Sparridæ* in this family, and give us also a beautiful representation of *Gerris Plumierii* (fig. 2.) and its allies; so close, indeed, in external form, that the similitude cannot possibly be greater: this will be at once apparent from the outlines here given of the heads of the genera *Datnia* (a), and *Gerris* (b).

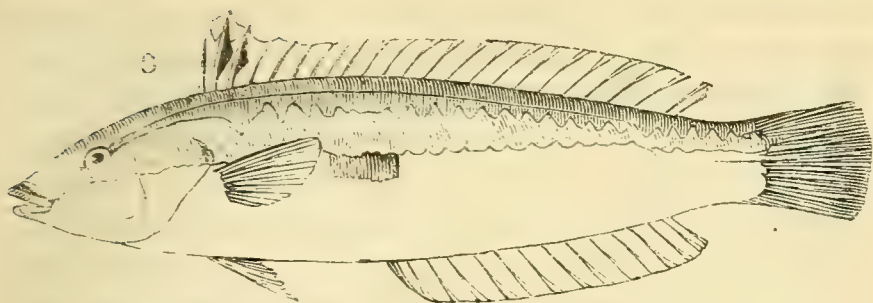
Having now closed the circle of the *Percidæ*, we proceed to the next, or sub-typical family.

(22.) The CHÆTODONIDÆ, or chætodons, are not only the most beautiful of the spine-backed order, but of the whole class of fishes. With the exception of the green and richly coloured *Labrinæ*, nearly the whole, and certainly all the typical groups, are confined to the warm latitudes of the tropics, and the shores and islands washed by the great Pacific Ocean. None of them are large fishes, while all appear to be nutritious and savoury food. The family is more numerous even than that of the perches, and contains such an immense assembly of greatly diversified groups, that only a few characters are applicable to the whole. From the perches, however, they are chiefly distinguished by the pre-operculum not



being serrated or toothed ; by the operculum itself being rarely armed with prickles ; and by the general smallness of their mouth : the whole of them inhabit the sea, and only the *Labrinæ* and the *Sparinæ* extend their range to northern latitudes. We arrange the whole under five great sub-families, each represented by the following Linnæan genera : *Chætodon*, *Sciæna*, *Sparus*, *Scarus*, and *Labrus*. With the exception of the second and third, these groups have undergone a most laborious analysis, the result of which will be found in our systematic arrangement : a few general remarks upon each is all that our space will allow us to insert in this part of our volume.

(23.) For the *Labrinæ* we have been prepared by the last division of the perches, where, as in *Percis*, the mouth is small, the body fusiform, and the lips fleshy : this latter character, in fact, is the most peculiar of all others belonging to these fishes, all of which have the mouth small, the lips very thick, and the jaws, especially at their tips, furnished with sharp conic teeth : the dorsal fin is always single, and the spiny rays are always shorter than those which are soft, — a proportion directly the reverse of that which is prevalent among the perches. The general colour of these elegant-shaped fishes is green, varied on the head, body, and fins, with stripes of the richest colours, but chiefly blue, purple, or red. Several of these are found in the British seas, and are the different species of wrasse, figured by Mr. Yarrell (vol.i. p. 279—300). In some of the minor groups, the pre-opercule is finely toothed, but there are no prickles on the operculum. In this family, we have defined, for the first time, many sub-genera, exhibiting the different types of form, particularly among the naked-headed wrasses, forming the genus *Julis*, one of the most lovely groups in the whole of this sub-family. The only species of this latter group that has recently been detected as a wanderer to our western coast, is the *Julis Mediterrana* of Risso (*fig. 3.*).



(24.) The true *Chaetodoninæ*, or typical chætodons constitute the perfection of the whole. They are short, broad, and almost orbicular fishes, much compressed, with a small head, and a still smaller mouth: the teeth are excessively fine, and resemble slender bristles, from whence their name has been derived: the dorsal fin is always single; and both that and the anal is always covered, more or less, with small scales, continued in a regular series from those on the body. In many of the sub-genera, particularly such as are highly typical, these scales extend almost to the edge of the fin, but they generally reach to one half, or two thirds, of its breadth. Of the beauty of these fishes, no pen or pencil can give an adequate idea: the body is generally of a silvery white, tinged with rose or yellow, upon which are delicate lines of vivid colours, relieved by ocellated spots and dark bands across the body and fins: they are particularly numerous in the Indian and Pacific Oceans, keeping near the shore or coral reefs; but not one is found so far north as the Mediterranean. Some are well known to possess the extraordinary power of shooting at insects with a drop of water ejected suddenly from their mouth, — a circumstance which appears altogether unique in this, or, indeed, in any other class of animals: some of the aberrant forms, again, present a most singular elongation of the ventral fins, and even of the dorsal and anal, so as to render them complete prototypes of the *Zeinæ*, or Dories in the tribe of *Scomberidæ*, or mackerels.

(25.) The *SCIÆNINÆ* succeeds the *chætodons* in most systems; and they appear intermediate between them and the *Sparinæ*: our analysis of these two sub-families is not yet finished, and we cannot therefore determine the minor groups with that precision which will be found in all the others. They have, in many respects, a close resemblance to the perches; but they are destitute of palatine teeth: the back is more arched, the mouth smaller; the tail and caudal fin incline upwards, and the muzzle is obtuse: some few, only, have the dorsal fin protected at the base by scales; so that, upon the whole, it appears to us, that their true characters, although understood by the eye of an experienced ichthyologist, have never yet been determined. Some of them grow to a tolerably large size; but they have neither the elegance of form of the wrasses (*Labrinæ*), or the beautiful colours of the *chætodons*, except, indeed, in two or three groups. There are a few species found in the European seas, but the majority are exotic.

(26.) The *Sparinæ* are not only evidently connected with the last division, but we suspect that several genera, therein included by Cuvier, will prove to be naturally arranged in this. In these fishes the pectoral fin is always pointed, and the caudal deeply forked: their colours are delicate, without being rich: the body is generally silvery, tinged with changeable hues of light blue, pink, and yellow: the fins, however, are always colourless, or at least only clouded by dusky brown: the teeth often vary in almost every species; and this has given rise to many sub-genera, which cannot be retained in a natural arrangement: some of these fishes are provided with strong grinding or molar teeth in the palate, while others have cutting teeth formed nearly on the same model as those of man. The Mediterranean, and even the more temperate seas of Europe, furnish us with many species, but the number evidently increases as their range approaches the tropics.

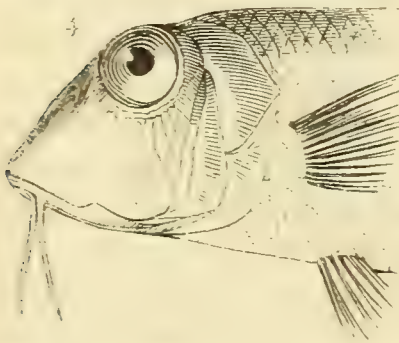
(27.) The *Scarinae*, or parrot-fish, constitute the last and the most aberrant sub-family. Their general shape

and style of colouring assimilates them very near to the wrasses (*Labrinæ*), but their head is thicker and their colours even more brilliant. The scales are very large, and always possess an unusual degree of hardness; they are sometimes serrated, and even assume the hexagonal form of the plates upon the *Plectognathes*, or cheloniform fishes. All the typical genera are distinguished by a character perfectly unique in this order: the jaws, which are very thick, perform the office of true teeth, being sharpened at their edges in the same manner as the majority of the *Plectognathes*. This similarity of the jaws to the bill of the *Psittacidæ*, joined to the vividness of their colouring, have caused these fishes to be named sea-parrots or parrot-fish: the uses for which their powerful jaws are designed is obviously to crush the hard coverings of those marine animals, as shells and crabs, upon which the *Scarinæ* are known to feed; such, also, are devoured by the cheloniform order, so that the analogy between the two is complete. The passage from these fishes to the *Labrinæ*, by means of *Xirichthys*, is no less obvious, and we thus return to the point from whence we commenced; each sub-family of the *Chætodonidæ* representing those of the *Percidæ*, and consequently all the other circular groups contained in this class.

(28.) The two next families, being aberrant, contain little more than generic examples. The first, that of the MUGILLIDÆ, or mullets, are lengthened and often cylindrical fishes, with very small mouths placed beneath an advanced and obtuse muzzle: the dorsal fins are very distant from each other, the teeth minute, and the sides of the head covered with compact scales: the crown is naked and bony. The grey mullet of our coasts is a typical example, and most of the foreign species are of the same hue. To these we join the genus *Polynemus*, or Paradise-fish of the Anglo-Indians, remarkable for numerous long flexible filaments placed near the pectoral fins, completely analogous to those we have already described in the genus *Trichosoma*: in one species, these appendages are so remarkably developed

as to be nearly five times the length of the body: the pre-opercule is serrated, but in all other parts of their structure the Paradise-fish betray the closest affinity to the mullets.

(29.) The MULLIDÆ, or surmulletts, have always been placed close to the *Triglidæ*, or gurnards, probably on account of a certain resemblance in the physiognomy of the two; for when we compare their structure, no two groups can hardly be more dissimilar. In the surmulletts the scales are large, deciduous, and smooth; in the gurnards they are small, tenacious, and rough: the head in one is compressed, in the other depressed. Nevertheless, the distant resemblance between them is of much importance when viewed as a relation of analogy only; and such we may safely pronounce it. The surmulletts, in fact, are clearly the chironectiform type of the tribe, representing the *Triglidæ* by their large



head, vertical eyes, and small mouth; and the *Gadidæ* by the fleshy cirrus or barbels on the lower jaw (*fig. 4.*). The species are few, and constitute two genera only. The surmulletts, like the *Holocentrinæ*, are nearly all of different shades of red, varied

with yellow stripes: it was the death of these fishes, so common in the Mediterranean, which gave delight to the effeminate and luxurious Romans, in the closing years of their power.

(30.) The last, and not the least interesting, of the aberrant families of the spine-finned order, is that of the SPIROBRANCHIDÆ, which corresponds to Cuvier's "labyrinthiform pharyngeals." This is perhaps the most natural of all the groups characterised by that admirable naturalist; and this not merely by possessing certain peculiarities of internal structure found in no other fishes, but also because they are equally distinct in their external conformation; while they present a beautiful gradation

tion between the soft-rayed *Blennides*, and the spine-rayed order, or the *Acanthopteryges*. The most important character they possess, to use the words of our author, "is in having a part of the superior pharyngeals divided into small laminæ, more or less numerous ; which form, by their frill-like undulations, intercepting cells, in which water can remain, flow upon, and moisten the gills when the fish is on dry land." Hence it is that they are enabled to crawl from the rivulets and pools, wherein they usually live, and either go to others, or hide themselves in hollow banks, &c., most probably during the dry season : this singular faculty was known to the ancients ; while the common Hindoos believe that these fishes fall from the clouds. As we shall enter more at large upon this subject in one of our future volumes, we shall at present merely advert to the external characters of these fishes : nearly all of them have the stomach remarkably short ; and the tail, in consequence, very long : the ventral fins are remarkably developed ; that is to say, not so much in size as in singularity ; for one or two of the rays are very long and filiform, while the rest are partially or entirely obsolete. *Macropodus* has the largest caudal fin, in proportion to its size, of any fish hitherto discovered ; while *Ophiocephalus*, with a long eel-like and cylindrical body, has all the dorsal rays flexible, like those of the *Blennides*, but they are branched. In all these characters the reader will not fail to perceive a union of those which separately distinguish the perches, the blennies, and the eels ; all being differently combined in a group of fish, which is related to the two first by affinity, and to the latter by analogy. On this theory, therefore, all the variations in the genera of the *Spirobranchidæ* can not only be reconciled, but explained in the most satisfactory manner : while the whole form a group representing the order **APODES**, in the great circle of the **ACANTHOPTERYGES**, and connecting it to the order of **BLENNIDES**. To this point, therefore, we shall again return, after tracing the different tribes which intervene between the **MACROLEPTES** and the **BLENNIDES**.

CHAP. III.

ON THE MICROLEPTES, OR SMALL-SCALED TRIBE OF THE
ACANTHOPTERYGIOUS FISHES.

(31.) THE second tribe of the spine-finned order, although very numerous, is inferior to the last. To mankind, however, it is of much more importance, since it contains all those of the order before us, which form the object of peculiar fisheries, in which respect it is analogous to the *Salmonidæ* among the ground-fish. The different species of tunny and of the mackerel are placed at the head of this tribe, the fisheries of which, in the Mediterranean and in Britain, employ many thousands of people and a vast amount of capital. The structure of these fishes, indeed, will give a tolerably good idea of nearly all those which constitute our present division. Having already pointed out their peculiar characters, we may at once proceed to indicate the primary groups into which they appear naturally to be arranged. The two great typical families are the *Scomberidæ*, or mackerels, and the *Centronotidæ*, or spinebacks. With these we place, as aberrant, the *Coryphænidæ*, or dolphins, the *Centriscidæ*, or trumpet-fish, and the *Echeneidæ*, or remoras. By far the greater part of the species are comprised in the two first,—an inequality which we have seen to be uniform throughout the whole class, as well as in the great divisions of the vertebrated circle. Yet there is such an evident tendency of these aberrant families to approximate to this tribe more than to any other, that however wide the intervals may be between some few which, on that account, appear in this and all other systems, to be isolated, yet we are not without valid induction for viewing them as congeners of the more typical groups. We shall therefore at once arrange these divisions in a column, and point out their analogies.

Analogies of the MICROLEPTES and the ORDERS.

Tribe MICROLEPTES	Analogical Characters.	Orders of FISH
SCOMBERIDÆ.	{ Typical ; the dorsal spines very strong.	ACANTHOPTERYGES.
ZEIDÆ.	{ Sub-typical; dorsal spines slightly developed in one, and obsolete in the other.	MALACOPTERYGES.
ECHENEIDÆ.	{ Body lengthened, sub-anguilliform : adhere to other bodies.	APODES.
CENTRISCIDÆ.	Body mailed ; mouth very small.	PLECTOGNATHES.
CORYPHENIDÆ.	{ Snout very obtuse, projecting beyond the mouth.	CARTILAGINES.

The two first represent each other by each holding the same rank in their respective circles ; and it will be observed that the spiny rays of the *Scomberidæ* are much stronger than those of the typical *Zeidæ*. The dorsal spines, indeed, of the latter are generally incipient, assuming the form of prickles, unconnected with a membrane ; whereas, in the whole of the typical *Scomberidæ*, the dorsal spines form as perfect an anterior fin as in any of the whole class. The well-known power of the remora to adhere to ships and moving objects, as the lampreys and suckers (*Cyclopteridæ*) do to stones, &c., is one of those beautiful analogies which result from a natural arrangement. No ichthyologist, indeed, would ever think of there being any affinity, or, in other words, any similarity of organic structure between the remora and the lampreys. M. Cuvier seems quite aware of this, and he merely places the genus *Echeneis* at the end of the *Cyclopteridæ*, to indicate its holding some sort of relation to those fish. It may at first excite surprise why the order of *Apodes* should only be represented in this extensive group by a single genus ; but this ceases on looking to the cartilaginous fishes, where we have inequalities equally great in this and in all other arrangements of that order. Besides, it should be remembered that we are now in one of the most typical divisions of the class, the very nature of which

implies that it should have as few aberrant or imperfectly organised types as possible; for otherwise it would not, in one sense, be eminently typical. This reason, by the way, is equally valid as a general explanation why nearly all aberrant groups in the higher classes of the animal creation, are so very inferior in point of numbers to such as are typical.* Having now shown the analogy of the *Echeneidæ* to the *Apodes*, that of *Centriscus* to the cheloniform fishes is obvious to every one. The *Coryphenidæ*, or dolphins, like the *Cartilagines*, or sharks, are remarkable for their blunt head, which is very much rounded, and projects over the mouth: in one, indeed, the head is compressed, and in the other depressed; but still the analogous character is beautifully preserved; and the great head, so prevalent in these groups, is only the modification of the fissirostral type among birds, and of the *Cetæ* among the *Mammalia*. These fishes, also, have the largest and the most powerful fins of any others in this group, just as the fissirostral birds have invariably the largest wings, both indicating peculiar swiftness either in swimming or in flying.

We may now turn to another test; and we shall find, by comparing the contents of this tribe with that of the entire circle of the spiniferous order, that many other beautiful relations will be elicited.

Analogies of the MICROLEPTES to the ACANTHOPTERYGES.

Families of the <i>Microleptes.</i>	<i>Analogies.</i>	Tribes of the <i>Acanthopteryges.</i>
<i>Scomberidæ.</i>	{ Scales particularly small; body } lengthened.	MICROLEPTES.
<i>Zeidæ.</i>	{ Body oval; short prickles in- } stead of dorsal spines.	MACROLEPTES.
<i>Echeneidæ.</i>	{ Adhere to other substances; } fins without spinous rays.	BLENNIDES.
<i>Centriscidæ.</i>	{ Body covered with hard sea- } brous scales or plates.	CANTHILEPTES.
<i>Coryphanidæ.</i>	{ Body excessively compressed; } head very obtuse; fins very } long or broad.	GYMNETRES.

* A striking exception, however, to this rule is presented by the order

The *Scomberidæ*, or mackerel, from having the smallest scales in the whole tribe, of course stand at the head of the *Microleptes*; while the sub-typical *Zeidæ*, on being compared with the sub-typical *Macroleptes* (which are the *Chætodonidæ*), are so strikingly alike, on a superficial view, that writers of the first eminence, before Cuvier, were perpetually confounding them; many of their shapes, in fact, are so much the same, that their resemblance cannot possibly be stronger, if each is to preserve its characteristic organisation. The *Echeneidæ*, again, find their perfect representation among the BLENNIDES, or blennies and gobies, since the funnel-shaped ventrals of the latter possess the same adhesive power as do the plates upon the head of the remora; these, be it observed, being the only sucking groups in their respective tribes. The *Centriscidæ* find their exact prototypes in the gurnards or CANTHILEPTES, several of which are covered by the same sort of rough scales or plates: while the *Coryphænidæ*, and the *Gymnetes* or ribband-fish, are so alike, that we were for a long time uncertain as to the exact point where they blend into each other. The whole of these families form one immense circular group, to the illustration of which, although full of interest, we can only devote a few pages.

(32.) The SCOMBERIDÆ, typically so called, contain the largest and the most highly flavoured of the whole tribe. Their body is always more lengthened than oval: their scales are very small, often imperceptible; and, notwithstanding the diversity of their structure, they all present, as now arranged, the universal character of being without any detached spines on their backs: they are thus distinctly separated from the next family, where this character is almost universal. The typical divisions have two dorsal fins, the second of which, as well as the anal, is followed by numerous finlets, which extend at equal distances, to the tail; they

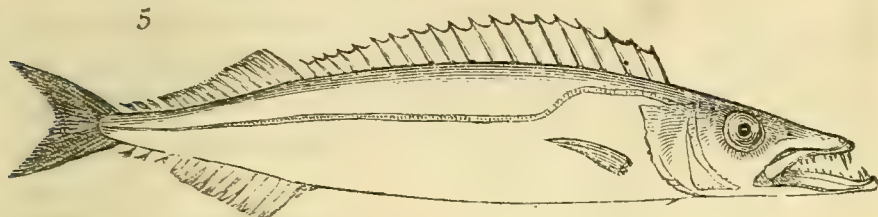
Colcoptera among the insects, which is the most aberrant of the *Ptilota*, and yet is perhaps the most numerous of all its orders.

are very much branched, and are completely detached from each other, being placed at much wider distances apart than are the true connected rays of the adjoining fins.* The other characters are of a secondary nature, inasmuch as they vary in the minor divisions. The most typical are the mackerels (*Scomberinæ*), and the tunnies (*Thymninæ*), both of which have two dorsal fins; the former, however, is distinguished by having the dorsal fins wide apart, while in the tunny they are close together: the pointed upper jaw of these latter fish, and their fleshy keel, or the carinated ridges on each side of their tail, brings them into close connection, as Cuvier well observes, with the sword fish (*Xiphius*). This group, which forms a sub-family, is composed of the largest fish in the whole order: they are generally found in pairs, wandering in the warmer seas of Europe and the tropics, but they are few in species, and thinly, although widely dispersed; some have been captured near fifteen feet long, and they appear to be so irritable and pugnacious, that they frequently rush at a vessel with such impetuosity as to drive their snout into the timbers so far that they cannot extricate themselves, and so perish.† There are one or two species which annually visit the Sicilian shores, whose flesh, as we can personally testify, is most delicious; more resembling, when fried, a veal cutlet, than any other meat. The sword fish have but one dorsal, yet this is often excessively high and long, while the ventral fins, which in the tunnies are very small, now become entirely wanting: the mackerels on the other hand follow the tunnies, from which they also differ in wanting that fleshy keel on the tail, seen both in the tunny and the sword fish. From these the passage appears very gradual to the genus *Gempylus* (*G. prometheus* C. fig. 5.), and this appears to lead us immediately to *Alepisaurus*, at

* These appendages are only found well developed, out of this family, in *Corynæmus* Cuv., the true situation of which may therefore admit of some doubt.

† M. Cuvier observes, that "a parasitical crustaceous animal penetrates into its flesh, and maddens it to such a degree that it sometimes darts itself on the shore."

present known only by one species. This extraordinary fish was discovered by Mr. Lowe, by whose excellent



description and figure we only know it. Two specimens were procured by this excellent and indefatigable naturalist on the coast of Madeira, the largest of which measured nearly five feet, although its body is so thin that it has justly been compared to the *Gymnetres*. It is a truly formidable fish; for so great was its ferocity that it attacked the men most furiously upon being drawn into the boat, so that they were obliged in self-defence to kill it by repeated blows. Its discovery is of the highest importance, not only as giving us a new family type, but as leading to the genus *Sudis* of Rafinesque, which has also an adipose fin, and evinces an equally strong relation of analogy to the *Sphyræninæ* in the next family. According to Mr. Lowe's views, the nearest affinity of *Alepisaurus* is to *Lepidotus* and *Trichiurus*.

(33.) It is in this family, and as its most aberrant type, that we have ventured to place the genus *Fistularia*, not, indeed, the incongruous assemblage of types now arranged under that name, but only the *Fistularia tabaccaria* of Block (pl. 387.), one of those singular types of the tubular-mouthed fish, scattered, like *Mormyrus*, *Gomphosis*, *Syngnathus*, &c. in all the orders. There is no observable affinity that we can trace between *Fistularia*, even as now restricted, and *Xiphius*, or *Alepisaurus*; and yet the analogy it bears to *Aulostoma* is so strong, that hitherto they have even been placed in the same division. It must be remembered, however, that *Aulostoma* cannot be separated, in a natural series, from the *Gasterostinæ*, because it is connected to them by

the sub-genus *Spinachia*, and seems immediately succeeded by *Mastecemblis*, so that the introduction of *Fistularia* among those genera would evidently interrupt and destroy the graduated chain that now exists. As other reasons will subsequently be given for thus breaking up the family *Fistularidæ* of M. Cuvier, we shall at once pass on to the next family, leaving this point to be decided by future analysis.

(34.) The *Centronotidæ*, or spine-backs, is a much more numerous, and consequently a more diversified group than the last: they are immediately distinguished from them, in all their typical examples, by having the first dorsal fin obsolete, it being represented only by a series of short detached spines, more or less distant, and placed before the true dorsal, which is undivided. There are but very few exceptions to this character*, which, added to the universally smaller size of the fishes themselves, and the absence (excepting in one group†) of detached finlets, similar to those of the tunny and mackerel, will serve as strong marks of distinction between the two families. They all possess, more or less, the natural characters of the *Scomberidæ*, that is to say, the scales are not much larger than the mackerel's; the pectoral fin is long and falcate, the body very silvery, and the caudal fin deeply forked or lunated. In both there is no instance in the typical groups of the pectoral or caudal fins being rounded: for the dory of Europe, and the genus *Capros*, are sub-genera of the most aberrant division of their own circle. Nearly all these fishes are inhabitants of warm seas. The only typical examples found with us are the scad mackerel of the sea, and the sticklebacks of our fresh waters.

(35.) We may commence a rapid sketch of this family by first noticing the singular genus *Mastecemblis*, having an eel-shaped body and fins, but excessively

* *Caranx*, *Seriola*, *Sphyræna*.

† *Corynemus* Cuv., which may eventually prove to belong to the true *Scomberidæ*: some two or three species of *Trachinus*, also, have a few finlets.

compressed: its great singularity, however, consists in the snout being prolonged, as is that of the sword fish, considerably beyond the mouth, the tip being armed with cartilaginous prickles. There are only a few species of small size found in India. *Notocanthus* has been placed, we think with much propriety, close to these fishes, for both have long bodies, or rather tails, and the back armed with a number of detached prickles. These types evidently represent one of the sub-families, and we have therefore called them the NOTOCANTHINÆ.

(36.) The ZEINÆ form the next, and a remarkably interesting group, eminently distinguished by the rhomboidal, and often nearly orbicular, shape of their bodies, their very small mouth, and the falcate shape of their dorsal and ventrals, which gives them all the appearance of *Chætodons* divested of scales. These latter appendages, indeed, except in the genus *Zeus*, are so small as not to be perceived, and appear to be hid under a soft satin-like skin. Some of these fishes are as grotesque and singular in their shapes as their prototypes, the *Scorpænidæ*, but they have all one character — a deeply lunated tail, and generally long falcate pectorals; although very broad, they are sometimes so remarkably thin, that they are scarcely looked on as articles of food. The major part were associated by the older writers with the true *Zeus*, and even M. Cuvier, although he has separated them into groups, still leaves the true dory and the *Capros* with them. Both these genera, indeed, although not typical, seem to be the most aberrant division of the whole, representing by their rough scales the gurnards, and the other *Canthileptes*, in this their own circle. This is manifested by the spiny processes on the back and head of *Zeus*, and the hard ciliated scales of *Capros*.* The minute spines before the dorsal fin are only apparent in *Apolectus* and *Seridermis*, the latter of which is remarkable, among other peculiarities, for the enlarge-

* We have equal scruples on the situation of *Stromateus*, which we have removed to the *Coryphæninæ*, a situation which seems to be more natural than that given to them in the *Reg. Animal*.

ment of the scales which form the lateral line, more especially towards the end of the tail, where, in some instances, they become analogous to those carinated plates so conspicuous in *Caranx*, and still more so in the *Gasterostidæ* or sticklebacks, a structure which beautifully illustrates the analogy of all these fishes to the gurnards.

(37.) Leaving the *Zeinæ* by means of the genus *Equula* Cuv., and some other kindred forms, we enter among the true CENTRONOTINÆ, or spine-backs, the distinguishing character of which is seen in their lengthened fusiform body; totally different from that of the *Zeinæ*, both as to form and thickness. Nearly all are covered with conspicuous scales, and armed with short sharp spines, placed before their dorsal fin, either erect or pointing forwards on their backs. It is here we place the genus *Siganus* of Forskill (*Amphicanthus* of Cuv.), on account of its possessing a recumbent spine, and from its close resemblance to *Psenes*, this last conducting us to the genus *Seriola*, which contains several sub-genera; as a whole, however, it is well distinguished, by having the dorsal spines so united as to form a second dorsal fin, perfectly separated from the hinder one. This group is beautifully connected to that of *Centronotus* (the type of the whole sub-family), by *Nomeus*, which unites most perfectly to *Naucrates*, a name given by Rafinesque to the celebrated pilot fish; and one of the very few of this author that has been adopted by Cuvier. Regarding these interesting fish, it will be seen, in the appendix, that two, if not three species, exist in the Mediterranean, unknown to Cuvier and Valenciennes. How far the fact is correct, of these fish being guides to the sharks, it is really difficult, if not impossible, to determine. It is contrary to all we know of nature, to suppose that the subsistence of one animal depends upon the guidance of another, or that every being is not endowed with those faculties necessary for its perception of danger, or for the procurance of its food; and yet several anecdotes, recorded by observing naturalists, very

much confirm the general belief, that the pilot-fish is sometimes a most useful friend to the shark.

(38.) *Naucrates* brings us immediately into the circle of the genus *Centronotus*, distinguished at once from that of *Seriola*, by having but a single dorsal fin; the anterior prickles being very short, and without any connecting membrane: even in this generic group we find the minor divisions preserve their analogy to the great types of this order; thus in *Scorpiis*, the fins are covered (as in the *Chætodons*) with minute scales, but those of *Centronotus* proper, are quite bare. Leaving these, our next genus is *Elacate*, where the body is still longer and narrower than in any of the preceding; it is, in fact, eel-shaped, and shows its affinity to *Sphyræna*, into which it passes, by having the lower jaw longest, the mouth wide, and the lateral line sinuated: under this we have assembled several remarkable sub-genera, possessing more or less the same characters, and representing the contents of the groups we have already gone through: the little *Porthmeus*, for instance, has the precise shaped head of *Elacate*, and with the commencement of a second dorsal; while, by its close resemblance, in other respects, to our *Zonichthys*, we are at once brought into the fifth and last division, namely, *Trachinus*. This group includes the horse mackerel, and all those of the same general form and structure, which, besides possessing two dorsal fins, have the lateral line armed with a series of large scales or plates, each terminated in a spine, so that the lateral line becomes mailed, and is indicated by a row of prickles pointing backwards: this is precisely analogous to what we see in the sticklebacks and the gurnards; and hence we conclude that the whole of these groups are analogous to each other. *Trachinus* is very numerous in species, particularly in the Indian seas; and the flesh of all we have met with is very fine. Of the five sub-genera, that of *Caranx* is chiefly found near the tropics; while several species of true *Trachinus* (regarded as but one by Cuvier and Valenciennes) occur in the Mediterranean and other European seas. We thus close the

circle of the *Centronotinæ*, and shall now look to its analogies.

Analogies of the ZEINÆ and the CENTRONOTINÆ to the sub-families of the ZEIDÆ.

Genera of the <i>Centronotinæ</i> .	<i>Analogies.</i>	Sub-families of the <i>Zeidæ</i> .	Genera of the <i>Zeinæ</i> .
<i>Centronotus</i> .	Dorsal fin single.	CENTRONOTINÆ.	<i>Lampris</i> .
<i>Seriola</i> .	Dorsal fin double.	ZEINÆ.	<i>Platysomus</i> .
<i>Siganus</i> .	Mouth very small.	NOTOCANTHINÆ.	<i>Equula</i> .
<i>Trachinus</i> .	Lateral scales rough.	GASTEROSTINÆ.	<i>Zeus</i> .
<i>Elacate</i> .	Dorsal single, very long.	SPHYRÆNINÆ.	<i>Apolectus</i> .

(39.) We regret that our space will not permit us to dilate upon any other of those numerous relations between these groups than those we have touched upon; and still more, that we can only indicate, with the same brevity, the mutual relations between the sub-genera of one and the other, when thus arranged.

Analogies of the sub-genera of SERIOLA, CENTRONOTUS, and ELACATE.

Sub-genera of <i>Seriola</i> .	<i>Analogies.</i>	Sub-genera of <i>Centronotus</i> .	Sub-genera of <i>Elacate</i> .
<i>Seriola</i> Cuv.	Dorsal fin entirely naked.	<i>Centronotus</i> .	<i>Elacate</i> .
<i>Tennodon</i> Cv.	{ Dorsal fin, with minute scales at the base. }	<i>Scorpius</i> .	<i>Chironemus</i> .
<i>Nomeus</i> .	{ Anterior dorsal fin nearly obsolete: body banded. }	<i>Naucratus</i> .	<i>Porthmeus</i> .
<i>Platylepis</i> .	{ Under jaw longest; mouth sub-vertical: lateral line with the scales large. }	<i>Lichia</i> .	<i>Tetragonurus</i> .
<i>Psenes</i> .	{ Front obtuse; muzzle truncated; mouth small. }	<i>Trachinotus</i> .	<i>Meladerma</i> .

Perfect as are the relations of the first and second columns, the third, or the sub-genera of *Elacate*, requires another set of analogies to render them complete: we have merely introduced them, in fact, that the ichthyologist may see how beautifully *Nomeus*, *Naucratus*, and *Porthmeus* represent each other. *Tetragonurus* also, which has been strangely located by our predecessors,

is clearly no other than the mailed or cheloniform type of *Elacate*, and is consequently the most aberrant of the genus.

(40.) Having now treated, in as much detail as our space will admit, on the two typical families of MICROLEPTES, we must be even more brief with the three that are aberrant; namely, the *Coryphænidæ*, the *Centriscidæ*, and the *Echeneidæ*. The first, indeed, is rich in the number and variety of its forms; but the two last are represented only by single genera. Having worked out all the divisions of the *Coryphænidæ*, and detailed them very fully in our systematic arrangement, the impossibility of giving further details, in this place, is the less to be regretted. The truth is, that it is utterly impossible, in two small volumes, to do the least justice to *all* the groups of ichthyology, since this would absolutely require a double extension of the work. Thus straitened, we have preferred enlarging upon a few groups; and leaving the others to be worked out, from the indications here given, by the reader; being quite assured of this—that he can come to no other conclusion, in the main, than we have arrived at.

(41.) The last sub-family of the *Zeidæ* is that of the *Sphyræninaæ*, of which the well known *Esox Sphyræna* of Linnæus is the type. Its close affinity to *Elacate* has already been mentioned; and its resemblance to a pike is so strong, that Linnæan writers actually placed it in the same genus. Both affinity and analogy thus conspire to sanction us in the situation we have here assigned to the genus *Sphyræna*; it is also obviously connected to *Atherina* by a new genus, hereafter defined, where we have a fish actually uniting in itself the characters of both these genera. If any further evidence was necessary on this point, we shall find it in the remarkable uniformity with which the great circles of the *Scomberidæ* and the *Zeidæ* represent each other, thus:—

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Analogies of the ZEIDÆ and the SCOMBERIDÆ.

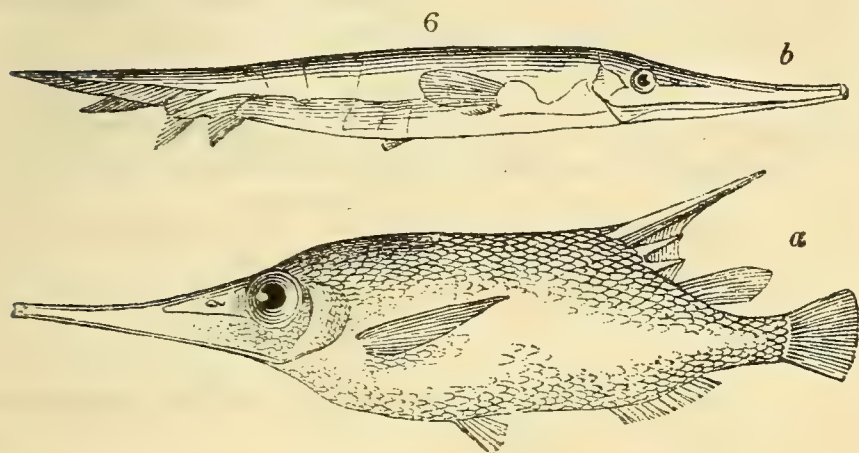
Sub-families of the SCOMBERIDÆ.	<i>Analogies.</i>	Sub-families of the ZEIDÆ.
SCOMBERINÆ.	Dorsal fins distinct.	CENTRONOTINÆ.
THYMNINÆ.	Dorsal fins united.	ZEINÆ.
ALEPISAUINÆ.	{ Body long, sub-anguilliform, cylindrical; mouth and teeth large; lower jaw longest and pointed. }	{ SPHYRÆNINÆ.
FISTULARINÆ.	{ Back armed with many naked spines before the dorsal fin; snout sometimes lengthened. }	{ GASTEROSTINÆ.
XIPHINÆ.	{ Lower jaw short, the upper pro- longed and pointed. }	{ NOTOCANTHINÆ.

These analogies are so conclusive, that we apprehend they need no amplification.

(42.) The exposition of the three last or aberrant families, which we had written out for so many chapters, must now be curtailed to as many paragraphs. The CORYPHÆNIDÆ, or the true dolphins, represent the *Gymnetres*, or riband-fish, to which they also open a passage from the *Scomberidæ*; to the latter they seem connected by *Alepisaurus* in one, and *Trichiurus* in the other: then follow, as sub-families, the *Coryphæninæ*, *Stromatinæ*, *Astroderminæ*, and the *Acanthurinæ*. These latter are a most charming and highly elegant group, representing the file-fishes (*Balistidæ*) and the scares (*Scarinæ*) in a manner truly surprising: it is rich in species, and we have therefore been able to work out, and to characterise for the first time, nearly all the sub-genera. Only two or three, out of the whole of this family, have been found in the British seas; the most familiar example being that of the sandlance (*Ammodytes*).

(43.) The family of CENTRISCIDÆ is represented only by the genus *Centriscus* of Linnæus. The whole structure, external as well as internal, of this singular group

shows that it has nothing more in common with *Fistularia* than it has with *Gomphosis*, *Mormyrus*, and other long-snouted types; all of which are only representations, in fact, of the *Syngnathidæ*: the hard scales of one type (*C. scolopax*, fig. 6. *a*) show its analogy to the



gurnards and to *Capros*, while the plates on the other, *Amphisile scutatus* Kl. (fig. 6. *b*), are exactly analogous to those of the loricated *Siluridæ*.

(44.) The ECHENEIDÆ, or remora-fish, we place at the end of this tribe, as representatives of the *Cyclopteridæ*, or suckers, without any fear of violating the order of nature. In all but their singular apparatus for adhesion, they exhibit the unequivocal characters of this tribe, particularly in their hard and almost cartilaginous pectoral and caudal fins: in the structure of the mouth, and some other curious particulars, they evince a relationship to *Sphryæna*; but, like the last group, they stand more isolated, in this and in all other systems, than any of the existing forms in the entire class.

(45.) We shall now assemble, and exhibit in one view, the chief groups in each of the five great divisions of the tribe to which this chapter has been devoted; and then, — having already said sufficient to enable the philosophic ichthyologist to apply our remarks to each and all, — we must leave their further exposition to those who may derive pleasure in following out our theory.

Analogies of the different Groups in the Tribe of
MICROLEPTES.

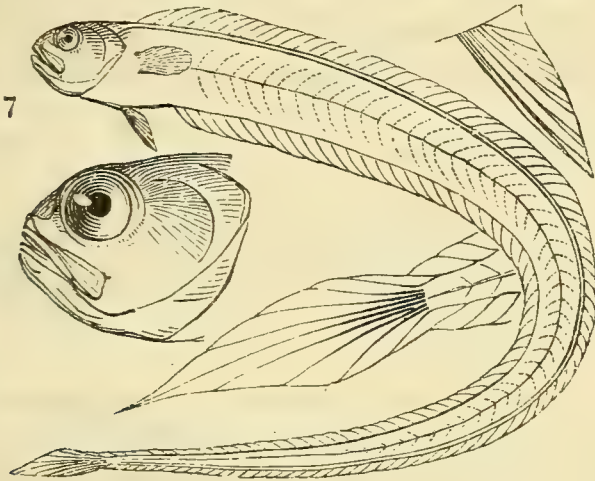
Families of the MICROLEPTES.	Orders of FISHES.	Sub-families of the SCOMBERIDÆ.	Sub-families of the ZEIDÆ.	Sub-families of the CORYPHENIDÆ.
1. SCOMBERIDÆ.	MALACOP.	<i>Scomberinæ.</i>	<i>Centronotinæ.</i>	<i>Coryphæninæ</i>
2. ZEIDÆ.	ACANTHOP.	<i>Thynninæ.</i>	<i>Zeinæ.</i>	<i>Stromatinæ.</i>
3. ECHENEIDÆ.	APODES.	<i>Xiphinæ.</i>	<i>Notocanthinæ.</i>	<i>Astroderminæ.</i>
4. CENTRISCIDÆ.	PLECTOGNATHES.	<i>Fistularinæ.</i>	<i>Gasterostinæ.</i>	<i>Acanthurinæ.</i>
5. CORYPHENIDÆ.	CARTILAGINES.	<i>Alepisaurinæ.</i>	<i>Sphyræninæ.</i>	<i>Trichiurinæ.</i>

CHAP. IV

ON THE GYMNETRES, OR RIBAND-FISH.

(46.) THE tribe of GYMNETRES, or riband fish, although vastly inferior, in point of number, to either of the more typical divisions, is yet one of the greatest interest, since it contains the most singular and extraordinary fishes in creation. In the genera of the *Coryphænidæ*, from which they insensibly pass, we were in a great measure prepared to see these singular characters in their full development before us. The form of the body, when compared to fishes better known, is more like that of the eel, the length being in the same proportion to the breadth; but then it is generally so much compressed, that these creatures have acquired the popular names of riband-fish, lath or deal fish, &c. The body, indeed, is often not thicker, except in its middle, than that of a sword; and, being covered with the richest silver, and of great length, the undulating motion of these fishes in the sea must be resplendent and beautiful beyond measure. But these and all the wonders of the mighty deep, are almost hidden from the eye of man. These meteoric fishes appear to live

in the greatest depths, and it is only at long intervals, or after a succession of tempests, that a solitary individual is cast up on the shore, with its delicate body torn and mutilated by the element or by the rocks. Such may be truly said of nearly all the genera contained in this tribe, the only exceptions being those of *Cepola* (fig. 7.) and *Ophidium*, which have a more

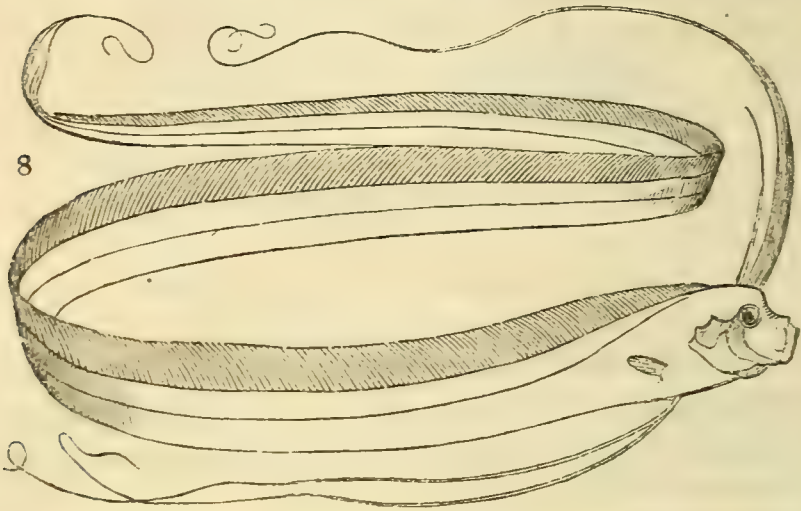


compact and robust organisation, and habitually frequent the same moderate depths as the generality of edible fish.

(47.) The Mediterranean Sea has hitherto produced by far the largest proportion of the riband-fish, and our discovery of some highly interesting forms so far back as in 1814 and 1815, but still unknown to ichthyologists, will not only show the excessive rarity of this tribe, but will evince how very little we yet know of the pelagic families, even in shores so often explored as those of the Mediterranean. The wide distribution of this group, which extends from the Arctic regions to the sunny shores of India, gives us every reason to suppose that they must be more numerous in inter-tropical latitudes than even in the Mediterranean, so that, much as we shall now augment the number upon record, we believe that not one tithe have yet been discovered. Upon the British coast, indeed, there has been, at remote intervals, two or three individuals cast

up; but in so mutilated a condition that to this day they are most imperfectly known. We allude to the *Gymnetrus Hawkensii*, figured by Bloch, and to slight notices of one, if not of two other and different species upon record. Those which are more strongly constructed, form the aberrant groups; and of these, among the rarest of our fishes, are the *Cepola* and the *Ophidium*; although both genera are common in the Mediterranean.

(48.) The annexed outline of the *Xiphiethis Russellii* Sw., or the blade-fish of India, will give the reader a better

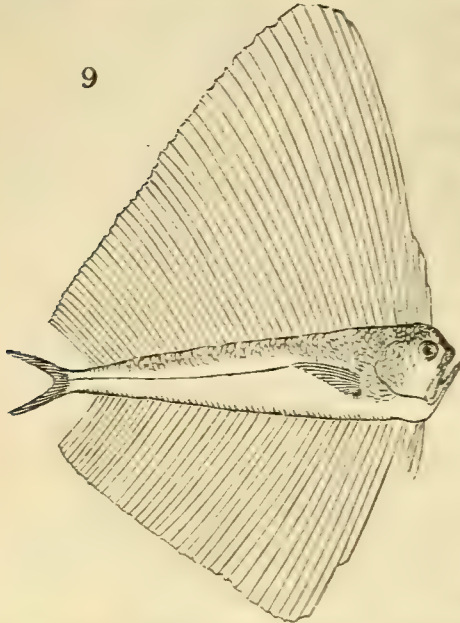


idea of the general character of these extraordinary fishes than the most laboured anatomical description. Notwithstanding the excessive length of the body, which reaches to 2 feet 8 in., it is so thin that it may well be compared to a straight sword-blade, highly polished or burnished with silver. The form of the body, or at least its length, varies in the different genera; but in all that have yet been discovered, excepting one, the dorsal fin extends the whole length of the back: this fin is often very broad, or more properly high, and its rays are so slender and fragile as almost to break on the slightest handling. The head is always excessively obtuse, the profile being obliquely vertical, so that it would seem as if the snout had been cut off: the belly is so long, that the vent is close to the extremity of the body, and this accounts

for the general absence of the anal fin in the typical divisions, while in those which are aberrant, the belly is short and the anal almost united to the caudal. The mouth is moderate, opening in an almost vertical direction, and only provided with a few small teeth. The scales, where they exist, are very thin and transparent, while the colour of the body gives the idea of its being overlaid with silver-leaf unburnished. The eyes are very large, and the gill opening very wide: by this latter character we may readily distinguish the *Cepola* and ophidians from the true apodal eel-shaped fishes, which in the form of their body they so much resemble.

(49.) The connection of this tribe to the last is rendered wonderfully perfect by the genus *Pteraclis* in one, and *Astrodermus* in the other: equally beautiful is the passage which *Ophidium* opens on one hand to the *Canthileptes*, or gurnards (by means of *Lepidolepris*), and on the other to the *Gadidæ*, by the genera *Phycis* and *Raniceps*. That singular fish called *Stylephorus* is no inapt representation of the *Fistularidæ*, and the other tubular-mouthed types. Thus related, we may proceed to a brief survey of the component parts of this tribe, whose internal groups may be thus named and defined:—1. The *Gymnetridæ*, where the ventral fins are either composed of filaments (*fig. 8.*), without connecting rays, or obsolete, or entirely wanting. 2. The *Trachypteridæ*, having the ventral fins perfectly formed, with connecting rays, as in the generality of fishes. These two are the most typical divisions, and include all those genera where the anal fin is altogether wanting. The remainder, or aberrant forms, as usual, are very few. Of the *Pteraclidæ* and the *Stylephoridæ*, we know not, at present, of more than a single genus in each. The first (*fig. 9.*) has the compressed silver-plated body of the *Gymnetridæ*, and the fins of the dolphins; yet their excessive breadth is beyond all parallel, for they far exceed those of *Astrodermus*. *Stylephorus*, again, is even a still more extraordinary form, bearing perfect analogy to the pipefish

(*Syngnathidæ*), as well as to *Fistularia*. Last of all come the *Ophidonidæ*, having a thicker and more robust



structure: they are perfectly eel-shaped, both in their long, slimy, and but slightly compressed bodies, and in the total absence of ventral fins: like those fishes, also, which they thus strikingly resemble, the dorsal and anal fins are united, without there being any distinct caudal. The *Ophidians*, however, are immediately known from all the *Anguilliform*

types by their branchia, the opening of which is very wide, while that of the *Apodes* is invariably contracted to a spiracle. The species, as yet, do not exceed four or five, and they are all rather small fishes. None of the *Gymnetres*, indeed, appear to be valuable as articles of food. In many countries they are looked upon by the fisherman with a somewhat superstitious feeling, and believed to be poisonous. The specimen of the *Lophotes Siculus*, subsequently described, weighed many pounds, and was served up at the table of the late king of Naples. The different species of *Cepolæ*, again, are found in abundance on the Sicilian coast, and are sold in the markets, with other moderate-sized fishes.

(50.) The systematic analysis of this tribe will be found elsewhere; and we shall now exhibit the result of this arrangement in regard to the relations which it bears to other tribes. If its analogies to the *Coryphidæ*, or dolphins, can be satisfactorily made out, the experienced ichthyologist will have no difficulty in comparing it with all the circular groups of the class that have been more analytically detailed.

Analogies of the GYMNETRES and the CORYPHÆNIDÆ.

Sub-families of the <i>Coryphænidæ.</i>	<i>Analogies.</i>	Families of the <i>Gymnetres.</i>
CORYPHENINÆ.	{ Ventral fin large, fully developed, and generally longer than the pectoral.	TRACHYPTERIDÆ.
STROMATINÆ.	{ Ventral fin very small, imperfect, or entirely wanting.	GYMNETRIDÆ.
ASTRODERMINÆ.	{ Dorsal and anal fins very long, and excessively broad; ventral very small.	PTERAULIDÆ.
ACANTHURINÆ.	{ End of the tail armed with short spines.	STYLEPHORIDÆ.
TRACHIURINÆ.	{ Caudal fin generally wanting; the tail pointed.	OPHIDONIDÆ.

To any ichthyologists acquainted with the forms now brought under comparison, it would be altogether superfluous to attempt any additional illustration in support of four out of the five of these analogies, for nothing in nature can possibly be more striking. The very fact of our being able to render the analogical characters so definite, is, perhaps, the best proof that the two groups are natural, for no author has ever had the idea that these resemblances were relations of affinity. The relation, however, between *Stylephorus* and *Acanthurus* is not so striking: but then it must be remembered that the first is only composed of one species; so that, in fact, we are completely ignorant of what other forms the family might, or do, contain. Certain it is, however, that these two have the smallest mouths in their respective circles; and that the end of their tail is armed with spines, although placed in a different position, and of different forms. Besides, as all the others agree so completely in possessing absolute characters in common, hyper-criticism may be spared on this point. If otherwise, and the analogy between *Stylephorus* and *Acanthurus* be denied, we shall fall back upon our affinities, and then refer the objector to the *Règne Animal*, where he will find *Stylephorus* arranged, without the least expression of doubt, among the ribband fish. But let us examine

this question a little closer ; the determination of three new types in the *Gymnetridæ*, now for the first time characterised, completes that group as a perfect circle ; inasmuch as its turns out, on further investigation, to contain representations not only of the primary divisions of the *Gymnetres*, but also of the *Coryphænidæ*. Let us therefore examine the analogies of

The GYMNETRIDÆ, the GYMNETRES, and the CORYPHÆNIDÆ.

Genera of the <i>Gymnetridæ</i> .	Analogical Characters.	Families of the GYMNETRES.	Sub-families of the CORYPHINIDÆ.
<i>Gymnetrus</i> Bl.	{ Typical of their re- spective circles. }	<i>Gymnetridæ</i> .	<i>Stromatinæ</i> .
<i>Xiphichthes</i> Nob.	{ Caudal fin more or less vertical ; ven- tral fin longer than the pectoral. }	<i>Trachypteridæ</i> .	<i>Coryphæninæ</i> .
<i>Nemotherus</i> Raf.	{ Ventrals entirely wanting ; tail smooth. }	<i>Ophidonidæ</i> .	<i>Trachiurinæ</i> .
<i>Gymnogaster</i> Brun.	{ Tail armed with spines ; ventrals none. }	<i>Stylephoridæ</i> .	<i>Acanthurinæ</i> .
<i>Lophotes</i> Giorn.	{ Ventral fins very small ; forehead elevated. }	<i>Pteraclidæ</i> .	<i>Astroderminæ</i> .

We have seen how prevalent is the spiny armature of the tail in all types representing the order *Plectognathes*. Yet with all this, we could hardly have expected to have found it in a group of such delicate fishes, and so unlike all others, as are the *Gymnetres*. Nevertheless, the recent light that has been cast on the *Gymnogaster* of Brunnich, or the deal-fish of Mr. Yarrell, has established this fact on the most conclusive evidence ; so that by comparing this type with *Stylephorus*, through the *Acanthuridæ*, we can no longer doubt of the true course of the two circles of the *Gymnetres* and the *Gymnetridæ*.

(50 a.) M. Cuvier has placed the genus *Cepola* along with that of *Lophotes*. Now, notwithstanding the very different structure and shape of the two forms, there

seems, nevertheless, some slight resemblance between them; though few, we apprehend, will join in the belief of their actual affinity. It appears, however, that, on comparing our distribution of the *Gymnetridæ* and the *Trachypteridæ*, we find that between the genera yet discovered of the first there is, in fact, a series of analogies to those of the second; a circumstance, we confess, we should not have discovered, but from a desire of ascertaining the precise situation of *Cepola*, which so beautifully connects the typical riband fish with the more robust Ophidians. We may look, therefore, to the analogies of the two families as pretty certain.

The GYMNETRIDÆ and the TRACHYPTERIDÆ.

Genera of the GYMNETRIDÆ.	Analogies.	Genera of the TRACHYPTERIDÆ.
<i>Gymnetrus</i> Bl.	{ Caudal fin or its rudiment horizontal.	{ <i>Argicthius</i> Raf.
<i>Xiphichthes</i> Sw.	{ Caudal fin more or less turned upwards.	{ <i>Trachypterus</i> Gou.
<i>Nemotherus</i> Raf.	{ Caudal fins perfect, horizontal : connecting the two groups.	{ <i>Cephalepes</i> Raf.
<i>Gymnogaster</i> Brun.	?	* * *
<i>Lophotes</i> Gio	{ "Snout short; mouth cleft obliquely * : " ventral fins perfect.	{ <i>Cepola</i> Linn.

The imperfection of this table, in the omission of the type which should represent *Gymnogaster*, is not to be wondered at: so little attention, in fact, has been bestowed upon this most interesting tribe, and they are so difficult to be determined, even in a fresh state, that not one half of the genera or species were known even to M. Cuvier†, who, not having seen them, almost dis-

* Cuvier.

† In a note appended to the genus *Gymnetrus*, M. Cuvier, after quoting numerous authors who have alluded to or described the different forms of the *Gymnetes*, concludes by observing, "All these fishes hardly differ in species, and not in the least as to genus."—*Griff. Cuv.* pl. 210. This hasty opinion, however, has, in part, been retracted by his subsequently adopting one genus (*Trachypterus*), which he appears to have seen. Caution and scepticism, in regarding the writings of others, may thus be carried beyond all reasonable bounds, more particularly when not sanctioned by actual knowledge of what we reject. In the present case we believe that not one tenth of these fishes have yet been discovered. We have adopted all the species of Rafinesque, for some, indeed, were actually communicated to him by us in 1815.

believed in their existence ! We doubt not, however, the type in question will some day be discovered, and in the mean time, as the relation between *Cepola* and *Lophotes* is given in Cuvier's own words, it will be received with that confidence and authority which ours may not. But we must now pass to another tribe.

CHAP. V.

ON THE CANTHILEPTES, OR SPINE-CHEEKED TRIBE.

(51.) THE fourth tribe of the spiniferous order, which we propose to distinguish by the name of CANTHILEPTES, from their prickly scales, corresponds in a great measure to that denominated *Joues Cuirassées*, by M. Cuvier. We seldom, if ever, wish to alter the names of large groups, but in the present order, where the primary divisions are so well characterised by the nature of their scales, it appears desirable to name the present group from that character most typical of itself, and of the numerous representations in this class. The *Canthileptes*, in fact, are the mailed fishes of the spiniferous order, just as the *Balistes* are among the semicartilaginous, and the *Siluridæ* in the soft-rayed order. We have already adverted to these analogies, no less remarkable than harmonious ; and we shall, therefore, at once take a general survey of the principal groups under which the whole appear to be naturally arranged : we may premise, however, that we exclude from these " mailed cheeks," of M. Cuvier, the *Gasterostri*, or sticklebacks, which are evidently the representations only of this tribe among the *Microleptes*. The structure, again, of *Trichodon*, places it, as we conceive, in a natural arrangement with the *Scorpenidæ* rather than with the perches. The affinity of *Uranoscopus* and *Trachinus* to *Cottus* and *Batrachus*, &c., has been so universally believed

and insisted upon by the first ichthyologists, that we feel no hesitation in restoring them to their station in the series: these and a few other alterations will, as we believe, render the *Canthileptes* one of the most natural groups in ichthyology. If we had any material doubts, they would be directed to the singular genus *Ryncthytys*, an obvious representation of *Xiphias*: some such form seems necessary to connect *Lepidoleprus* with *Peristedion*, two genera which, in all their essential characters, obviously belong to this tribe.

(52.) The leading divisions of the *Canthileptes*, as here arranged, are as follows:—1. The *Triglidæ* or gurnards, having the body entirely covered by small prickly scales, very compactly arranged, and generally accompanied by rows of spines, placed along the lateral line. 2. The *Scorpænidæ*, or spine heads, having much of the general aspect of the gurnards, but with the body much thicker, and unarmed with pointed scales. In both these, the head is defended by bony plates, ending in numerous spines and sharp prickles; while the pectoral fins, always large, are often enormously developed; these fins, likewise, are often accompanied by certain finger-like processes at their base, which are not connected by any membrane, and seem to be merely a prolongation of the lower rays of the pectorals, unusually developed. These processes disappear in the three aberrant divisions, represented by the *Cottidæ* or bull-heads, where the ventrals are imperfect, and but of few rays, the *Agonidæ*, or mailed fish hitherto included with the last, and the *Lepidolepres*, or sword gurnards, having the snout lengthened, the body eel-shaped, and the scales almost mailed, as in the *Triglidæ*.

(53.) The TRIGLIDÆ, or gurnards, are well known inhabitants of temperate seas; and those found upon our own coasts have been recently so well illustrated, that little of a popular nature need here be said upon them. Scientifically, they may be considered as composed of five genera, differing from all others of this tribe* by

* Except the *Agonidæ* just mentioned.

being covered with close-set, compact, spinous scales, or large plates, by which the body becomes nearly as much mailed as in the file fish (*Balistidæ*), and the mailed silures (*Loricarinæ*). Of three of these genera, which are aberrant, hardly more than one species is at present known; but in the two others there are several sub-genera, more especially in that of *Trigla*, composed of the true gurnards, where, from the number of species now determined, all the sub-genera, would seem to exist. Having paid particular attention to this group, which abounds in the Mediterranean, we shall now give the result of their analysis.

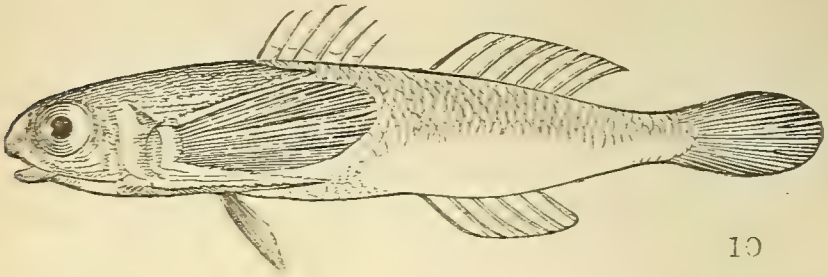
(54.) The genus *Trigla* is composed only of those gurnards which have the lower rays of the pectoral fins assuming the form of detached finger-like processes, unconnected by a membrane, and furnished with a slightly lunated caudal fin. This latter character, indeed, has been so little regarded in ichthyological groups, that the form of the caudal is often not even noticed by our best authors. Its great importance, however, has been already shown, and in the present case its value becomes apparent, because it is the only decisive distinction between the typical gurnards and the *Scorpenidæ*: two groups, abundantly different, indeed, but which have several characters in common; both, in fact, give us examples of very large pectorals and naked processes; but the caudal fin of the *Scorpenidæ* is always rounded and the body more or less naked. Restricting, therefore, the genus *Trigla* by these characters, we may trace a gradual progression in the developement of the pectoral fin, which, in the tribe before us, is of great importance. The nearest approach to *Rynchytys* is seen in the subgenus *Peristedion*, where the naked processes are only two, and the snout is so greatly developed, that the lower jaw is nearly as much beneath it as in *Rynchytys*. That several forms must intervene between these two cannot, indeed, be doubted; and, so long as this interval exists, we may even suspect that this relation is merely analogical; but that question, however im-

portant, has little to do with our present purpose, which is merely to trace the *internal* relations of the *Triglidæ* as manifested among the genera. *Peristedion* is known by its lengthened shape and its cuirassed scales, which form several rows of spines on each side of the body; and it has, like the sturgeons, soft cirri or beards on the lower jaw, characters altogether peculiar to this form: the pectoral fins are moderate and rather longer than the ventrals. Then comes the restricted sub-genus, *Prionotus*, where the pectoral fins are greatly increased, so that they reach their highest developement in *this* group, although not in the next. We separate, under the sub-generic name of *Ornichthys* those American gurnards that have the caudal fin rounded, in opposition to *Prionotus*, which is truncate or lunate, as in all the other divisions: this new group may possibly form the passage between *Prionotus* and *Dactylophorus*, but we place *Ornichthys* within the confines of the *Triglidæ*, that the regular series of the digitated gurnards should not be broken. The union of *Prionotus*, as now restricted, with *Ornichthys*, is effected so completely by our well known *T. Lyra*, or piper-gurnard, that the presence of dorsal spines alone prevents this fish from being classed as a *Prionotus*.

(55.) The genus *Dactylophorus* is more especially composed of the flying gurnards, so called from the faculty they are stated to possess of sustaining themselves in the air for a short time, something like the flying fish; but we must confess never to have once witnessed this sight during near nine years spent on the various coasts of the Mediterranean, where, as authors say, these flying fish may be seen "in profusion." The immense size of their pectorals certainly appear to justify this alleged habit, for they far exceed those of the gurnards. The variations yet known are very few, so that we are only acquainted, at present, with two of the types.

(56.) The little fish forming the genus *Cephalocanthus* (*fig. 10.*) has the rounded caudal of *Ornichthys*, and the short obtuse head of *Dactylophorus*. Of the remaining genera of the *Triglidæ*, mostly represented by single

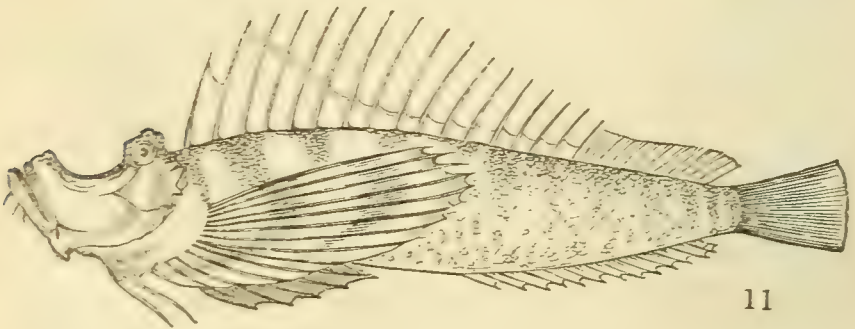
examples, nothing can be said beyond that they are all clothed with very hard scales, and that they appear



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analogical representations of the families composing this tribe. *Trachichthys*, indeed, may eventually prove to be related to *Monocentris* by affinity rather than by analogy. It may be placed, however, in the present division, as the only aberrant form where the lateral line is armed with spinous plates analogous to *Caranx*, but we believe it is truly connected to *Holocentrum*.

(57.) The *Scorpænidæ*, or spine-heads, like the gurnards, have the head covered with spines, but their bodies are generally destitute of those rasp-like or prickly scales possessed by the *Triglidæ*. They are certainly, with the exception of the *Chironectidæ*, the most ugly and repulsive fishes in existence, many of them, like those of the genus *Pelor* (fig. 11.), but more



11

especially the *Synanchinæ*, or toad-fish, appear more like fanciful monsters of the artist's imagination than creatures having a real existence. Independent of the head being often enormously large, it is always armed with

formidable spines of different sizes, and placed in various directions ; so that their appearance is not only repulsive, and even horrid, but their handling becomes dangerous. Their most prominent distinctions, however, from the *Triglidae*, seems not to have been perceived by M. Cuvier: these, according to our analysis, appear to consist in the ventral fins being always placed considerably behind the anterior part of the very broad base of the pectorals ; so that, in fact, the genus *Trichodon* is but a modification of this structure, and naturally brings it within the present division. All these fishes are peculiar to the tropical seas of India ; none of them are very large, nor are they sought after as articles of food. The species are much more numerous than those of the *Triglidae*, and consequently present a greater diversity of forms. We arrange the whole under the following genera : —

1. *Platycephalus*, distinguished by its lengthened shape, enormous eyes, and remarkably broad head.
2. *Scorpæna*, having the body thick, the mouth opening as in ordinary fishes, and the pectoral fins, which are always large, often furnished with one or two detached rays, as in the gurnards.
3. *Synachia*, where the eyes and the opening of the mouth are vertical, and the dorsal fin single.
4. *Blepsias*, having high and large dorsals, which extend the whole length of the back, small and imperfect ventrals, and cirri round the mouth. And lastly, *Agriopus*, having the mouth very small, and the high dorsals of *Blepsias*, but with the body covered with a hard tuberculated skin.

(58.) The chain of affinities by which all these groups are connected is particularly interesting: some of these we shall presently notice. Let us first, however, draw up the following table, as explanatory of the analogies between the typical genera of the two families.

Analogies of the TRIGLIDÆ and the SCORPÆNIDÆ.

TRIGLIDÆ.	Analogical Characters.	SCORPÆNIDÆ.
<i>Trigla.</i>	{ Ventral fins generally placed under the pectoral : detached processes.	{ <i>Scorpæna.</i>
<i>Dactylophorus.</i>	{ Ventral fins behind the pecto- ral ; pectoral fins very large, without detached processes.	{ <i>Synanchia.</i>
<i>Oplichthus.</i>	{ Body slender, lengthened : the head excessively broad.	{ <i>Platycephalus</i>
<i>Trachichtys. ?</i>	{ Body mailed with plates or tu- bercles.	{ <i>Agriopus. ?</i>
<i>Rhynchithys.</i>	Dorsal fin very long.	<i>Blepsias.</i>

It is impossible to doubt that the three first groups in each family are mutual representations ; but, as there is only one species of the last, that is, of *Rhynchithys* and *Blepsias*, so their analogy, from being obscure, can only be rendered equally strong with the others by being traced through the medium of other groups. *Blepsias*, in fact, by its imperfect ventrals, is a *Cottus* among the *Scorpænidæ*, and leads immediately to that family ; while *Rhynchithys* as perfectly represents the *Lepidolepridæ*. If the student, then, wishes to work out these two analogies, he has only to compare the circles of the *Triglidæ* and *Scorpænidæ* with that of the whole tribe, and he will find the same results from our arrangement of their respective affinities.

(59.) There is, nevertheless, so much of deep scientific interest attached to this group, in reference to the station we have assigned to the *Syngnathidæ*, that limited as is our remaining space, we cannot omit the results of our analysis of the *Scorpænidæ*, particularly as they will be found to strengthen, in a remarkable manner, all that has been advanced regarding the *Triglidæ*, or gurnards. The genera, indeed, which we now arrange under the general family name of *Scorpænidæ*, are, in truth, the most typical of the whole tribe, just as the *Chironectidæ* are of the order *Plectognathes*. To dilate upon the extraordinary resemblance in their general external appearance and anatomy, which these two groups possess, would be quite superfluous ; for, were their skeleton and branchial apertures the same, they would then be placed close to each other. The *Triglidæ*,

in like maner, with their small mouths. and prickly bodies, equally typify the *Balistidæ*. The ichthyologist, however, understanding these relations, can easily pursue the analysis of the others.

(60.) The two typical divisions of the *Scorpænidæ* are so numerous and remarkable in the forms they contain, that we are compelled to view them as sub-families rather than as genera. We shall therefore call them the *Scorpæninæ*, or spine heads, and the *Synanchinæ*, or toad-fish ; for by this latter name we shall not only designate their direct analogy to the true amphibians, but convey some faint idea of their disgusting and hideous ugliness. The power of leaping from the water, which so many of the *Triglidæ* and some of the *Scorpæninæ* possess, is another and a most remarkable point of analogy they bear to the frogs, while the warty fungous-like skin, and hideous shape, of the *Synanchinæ*, devoid, as they are, of leaping like the gurnards, render them no less strikingly analogous to the toads. Thus we have another verification of our views regarding the station of the entire order, which corresponds to that of the amphibians in the vertebrated circle, and to the order *Plectognathes* in that of fishes ; but we must leave these distant analogies, and look to those more immediate.

(61.) The *Scorpæninæ*, or spine heads, are so named because the greater part were comprised by Linnæus under this name ; but the genus *Scorpæna*, as restricted by modern ichthyologists, has unluckily been given to a group which is not typical of the whole. They are at once distinguished from the *Synanchinæ*, or toad fish, by the mouth opening horizontally, as in the generality of fishes, and the eyes being situated in the middle of the sides of the head ; whereas, in the latter, the mouth opens almost vertically, and the eyes are close together, and inserted nearly on the crown. The first are generally furnished with scales on their bodies, but the latter have none. These distinctions are obvious to every one, and save us a world of circumlocution and anatomical details. The *Scorpæninæ*, thus characterised, are again resolvable into five groups, or genera : 1. *Apistes*, 2.

Pterois, 3. *Tænionotus*, 4. *Sebastes*, and 5. *Scorpæna*, the latter being united to *Apistes*, by such fish as the *Apistes marmorata* of Cuv. The union of the two extremities of this series is absolutely so perfect, that it is only by attending to the most refined characters, we can determine where one ends, and the other begins.

(62.) The genus *Trichodon* (fig. 12.), or that of *Sebastes*, is one of the types of this series : both are



distinguished from all the *Macrolepes* by its pectoral fins ; and this gives us an opportunity of stating another peculiarity of the entire family, we had almost omitted, in the multiplicity of others, to mention. In the whole of the *Scorpænidae*, the pectoral fins are excessively broad at their base ; and, at their inferior part, make a considerable advance towards the throat. By this singular formation, unknown in any other tribe, except the typical *Plectognathes* or *Chironectidae*, the ventrals are thrown backward, so that they are almost invariably placed behind the pectorals. Something of the same character is also continued onward to the next tribe of the blennies ; but then the situation of the ventrals is reversed, and they are considerably in advance of the pectorals : this and other essential differences renders *Uranoscopus* and *Trachurus* merely analogical to *Temnodon*, and was doubtless the chief reason of Cuvier's excluding them from our present group.

(63.) Referring the ichthyologist to the series of affinity, as detailed in their specific characters, by which the genera *Apistes*, *Pterois*, *Tænianotus*, *Trichodon*, and *Scorpæna* are mutually connected, and thus demonstrated to be a perfect circular group, we shall now show its analogical relations to the other divisions of the family, and to those of the *Triglidae*.

Analogies of the Sub-family SCORPÆNINÆ.

Genera of the SCORPÆNINÆ.	<i>Analogies.</i>	Types of the SCORPENIDÆ.	Types of the TRIGLIDÆ.
<i>Apistes.</i>	{ Pectoral fins large, with detached processses. }	SCORPÆNA.	<i>Trigla.</i>
<i>Pterois.</i>	{ Pectorals excessively large, but without detached processes. }	SYNANCHIA.	<i>Dactylophorus.</i>
<i>Tænianotus.</i>	Dorsal fin very long.	BLEPSIAS.	<i>Rhynchitrys.</i>
<i>Sebastes.</i>	{ Mouth vertical; body mailed with plates or tubercles. }	AGRIOPUS. ?	<i>Trachichthys.</i>
<i>Scorpæna.</i>	Head very large.	PLATYCEPHALUS.	<i>Optichthys.</i>

We have not space to enlarge upon this table ; replete as it is with innumerable relations to all the others contained in this volume ; but we beg the reader's attention to another no less curious, by which it will be seen that the *Scorpæninæ* and the *Synanchinæ* equally represent each other in their details, as well as intimately corresponding with the two other columns just enumerated.

Analogies of the SCORPÆNINÆ and the SYNANCHINÆ.

Genera of the SCORPÆNINÆ.	<i>Analogies.</i>	Genera of the SYNANCHINÆ.
<i>Apistes.</i>	{ Dorsal fins united, or but slightly divided ; pectoral fins moderate. }	<i>Synanchia.</i>
<i>Pterois.</i>	{ Pectoral fins excessively large : dorsal rays greatly lengthened. }	<i>Pelor.</i>
<i>Tænianotus.</i>	{ Dorsal fin extending the whole length of the back ; eyes very large. }	<i>Erosa</i> Sw.
<i>Sebastes.</i>	{ Dorsal fins two, equal, almost united ; mouth vertical. }	<i>Trichophasia</i> Sw.
<i>Scorpæna.</i>	{ Mouth opening obliquely ; head with cirri. }	<i>Hemitripterus.</i>

With such resemblances as these, so definite as almost to assume the precision of generic characters, it would, in fact, be absolutely impossible to tell which was a *Scorpæna* and which a *Synanchia*, were not these two series permanently distinguished ; the one having the body covered with scales, and the mouth horizontal,

while in the other the body is naked, and the mouth vertical: these characters, however, are softened down and interchanged in the aberrant examples, so that at these points the two groups may be said to blend into each other in so perfect a manner, that but for our seeing, in *Apistes* and *Synanchia*, *Pterois* and *Pelor*, what were the true types of each column, we should be in no small danger of confounding one with the other.

(64.) But that the important question should be determined, whether or not the theory of representation, and all our other propositions, can be demonstrated as clearly in ichthyology as they have been in ornithology, we shall now attempt to proceed a step further. In reference to this and the last tribe of spiniferous fishes, we have gone on to analyse one group after another, (each smaller and more limited than that which preceded it), until, at last, we have come to the genera. Fortunately, however, in this, as in the *Zeidæ*, we can advance into the sub-genera; and, that we may not be supposed to be influenced by a natural prejudice in favour of our own views, we will take one of the genera of M. Cuvier, a group which he has himself determined to possess so many characters in common, as to deserve the name of a genus. This group is his *Apistes*; we shall take it, therefore, as his own, and by the help of his own admirable descriptions, his no less instructive figures, and our own personal knowledge of the species, we shall endeavour to bring this vital question to a final issue,—at least, in this class.

(65.) *APISTES*, then, according to Cuvier, is a group of small-sized fishes, either naked, or with small scales, possessing much diversity in general shape, but all having the head more or less covered with spines, and particularly armed with two, one on the suborbital, and another on the preopercule. The head is not crested, as in the *Scorpena*; and the pectoral rays, instead of being simple, are always branched. These are very plain and tangible characters; and we are now to determine, whether, among these fishes confined by our author to

a single genus, there are not representations of all the families, and other circular groups in this and the other tribes of the class PISCES. For this purpose, we have here placed some of the species of our learned author's *Apistes* opposite to the primary groups in which we have distributed the family: these types we propose to distinguish as sub-genera.

Analogies of APISTES and SCORPÆNA.

Sub-genera of <i>Apistes</i> .	Types as described by Cuvier.	<i>Analogies.</i>	Divisions of the SCORPÆNIDÆ.
<i>Apistes</i> Cuv.	<i>A. monodactylus</i> .	{ Typical; pectoral fins moderate; scales very small or none; head very spiny.	{ APISTES Cuv.
<i>Pterycthus</i> Sw.	<i>A. alatus</i> .	{ Pectoral fins considerably lengthened; scales distinct.	{ PTEROIS Cuv.
<i>Platypterus</i> Sw	<i>A. tænianotus</i> .	{ Dorsal fin very high, undivided, and extending the whole length of the back.	{ TÆNIANOTUS Cuv.
<i>Trichosoma</i> Sw.	<i>A. trichonoides</i> .	{ Mouth sub-vertical; dorsal fins two, the first short, the second long and narrow.	{ SEBASTES Cuv.
<i>Gymnapistes</i> Sw.	<i>C. marmoratus</i> .	{ Dorsal fin emarginated beyond the middle; body naked.	{ SCORPÆNA Lin.

(66.) If any thing further were necessary to illustrate these most extraordinary coincidences, it would be the testimony of M. Cuvier himself; this testimony, as collateral evidence, may be called conclusive; because it is not given in support of any particular theory, but merely from his own perception of the resemblances which his species bear to other genera, and in conformity with which he gives each of them a *specific* name expressive of those resemblances. Now, it will be remembered, that the divisions of the *Scorpænæ* correspond to those in which we have divided the whole of this tribe. That this symbolical relationship should be brought before the reader at a single glance, we shall now place all these groups, and several others equally analogous, in one table.

Analogies of the Sub-genera of **APISTES.**

Subgenera of <i>Apistes.</i>	Genera of the <i>Scorpænidæ.</i>	Families of the <i>Canthi-leptes.</i>	Tribes of <i>Acanthopteryges.</i>	Families of the <i>Plectognathes.</i>
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TYPICAL.

<i>Apistes.</i>	<i>Apistes.</i>	<i>Triglidæ.</i>	MACROLEPTES.	BALISTIDÆ.
<i>Pterichthys.</i>	<i>Pterois.</i>	<i>Scorpænidæ.</i>	MICROLEPTES.	CHIRONECTIDÆ.

ABERRANT.

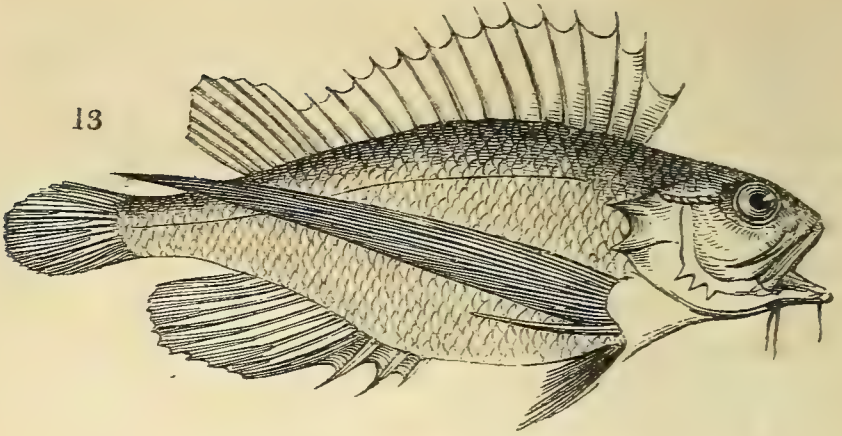
<i>Platypterus.</i>	<i>Tænianotus.</i>	<i>Lepidolepridæ.</i>	GYMNETRES.	LOPHIDÆ.
<i>Trichosoma.</i>	<i>Sebastes.</i>	<i>Agonidæ.</i>	CANTHILEPTES.	SYNGNATHIDÆ.
<i>Gymnapistes.</i>	<i>Scorpæna.</i>	<i>Cottidæ.</i>	BLENNIDES.	POLYPTERIDÆ ?

(67.) The breadth of the page not admitting of the analogical characters being inserted in our usual manner, we shall glance at a few of the most remarkable, passing over several others, which may be elicited by the experienced ichthyologist. Beginning with the entire genus *Apistes*, at the head of the second column, we observe how perfectly the types represent those of the *Triglidæ* by having detached processes before the pectoral fins, while the *Triglidæ*, being the most scaly of the *Canthi-leptes*, correspond to the *Macroleptes* and the *Balistidæ*, both of which, in their own circles, have the strongest and the most regular scales. *Pterichthys*, *Pterois*, *Pelor* (among the *Scorpænidæ*), with the *Scomberidæ*, and *Zeidæ* (among the *Microleptes*), all agree with the *Chironectidæ* in the great developement of their pectoral fins. The next set of groups are all remarkable for their obtuse muzzle; whether that muzzle be depressed or compressed, and almost universally by their long and very high dorsal fin. The hardest-scaled and most completely mailed fishes are found in the next series, while those having the ventral fins small, or imperfect, or totally wanting, are in the concluding line. True it is, that the genus *Scorpæna* has not this character; but what says M. Cuvier, in his very first sentence on these fishes? “*Les Scorpènes ressemblent beaucoup aux Cottés.*” And who can deny this? If indeed they resembled them in their ventral fins as well as in all other things, they would merge into the same group!

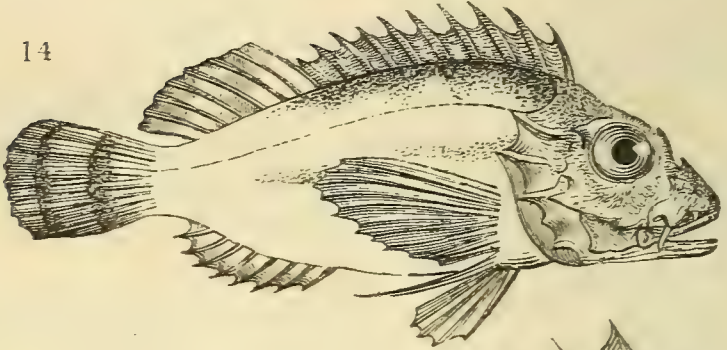
(68.) But our volume is intended, not merely for the scientific naturalist, but also for those who are merely attached to the contemplation of nature in the abstract; and who desire to have some of these singular analogies brought before them, that they may judge themselves how far their own unscientific eyes can see these symbolical relationships of which we are continually speaking. The contours of fish have a greater air of *individuality*, perhaps, than those of the more perfect vertebrated animals; and we shall, therefore, now give to the analogies of the sub-genera of *Apistes* a form and substance which will speak more to the uninstructed, yet intelligent, reader, than all the scientific details we have gone into by words. On one side of the following pages, are given, in faithful outline, representations of the five sub-genera of *Apistes*, opposite to which is a characteristic figure of the *genera*, or higher divisions of the *Scorpæna*, which they represent.

On the left hand side are the typical examples of the five sub-genera, or minor divisions, we have made out of Cuvier's genus *Apistes*; namely, *Plericthys* (fig. 13.), with its long pectorals and serrated mouth, representing in all these particulars the genus *Machrochirus*, or *Pterois*, at fig. 17. of the opposite page; next comes the typical example of *Apistes* proper, which is but another instance of the same form at fig. 18.; following these, we see, on the left, the sub-genus *Platypterus*, at fig. 15., having the very broad dorsal fins and the short obtuse head of *Tænianotus* (fig. 19.), both of which are exact analogies of the dolphins to the ribband-fish (fig. 9.); last of all comes *Trichosoma*, at fig. 16., representing *Sebastes* (fig. 20.), as well as *Trichodon* (fig. 12.). We regret that the size of our page would not admit the introduction also of the fifth types in each, viz. *Gymnapistes* and *Scorpæna*; but every ichthyologist knows that these two are so perfectly like each other, that they are only separated by those one or two characters which prevent *APISTES*, as a whole, from being united with *Scorpæna*.

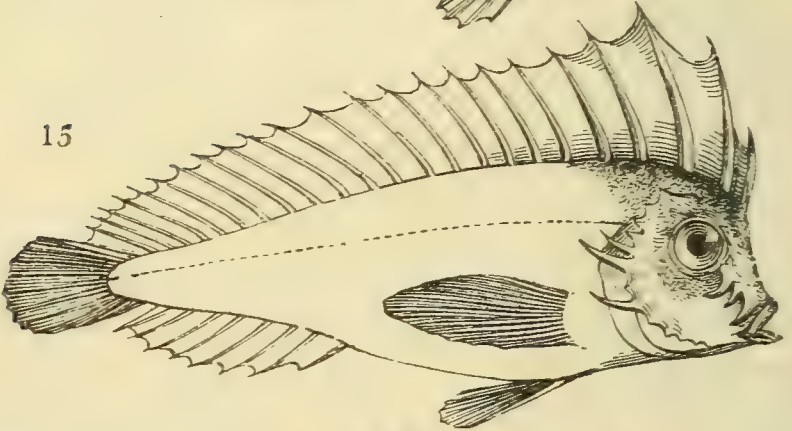
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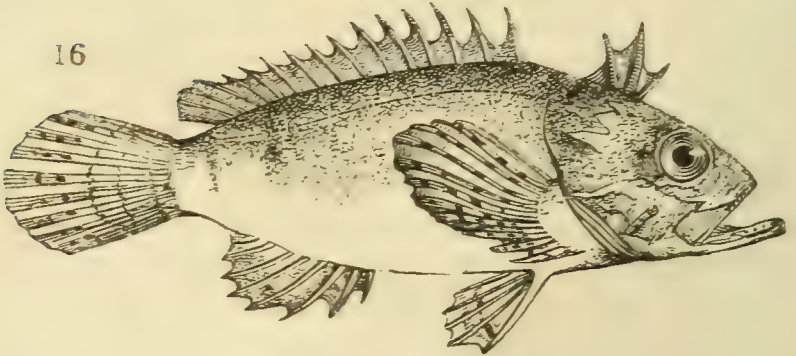
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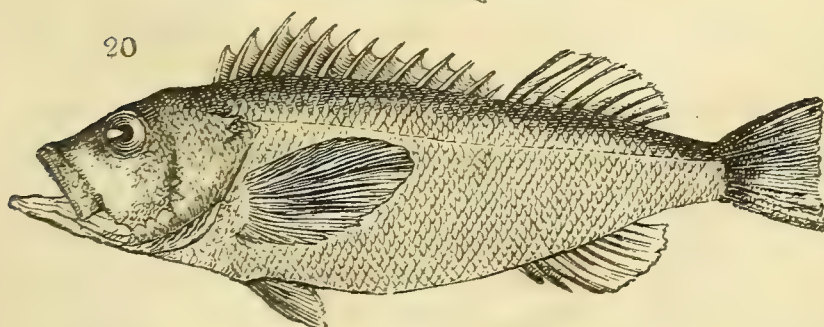
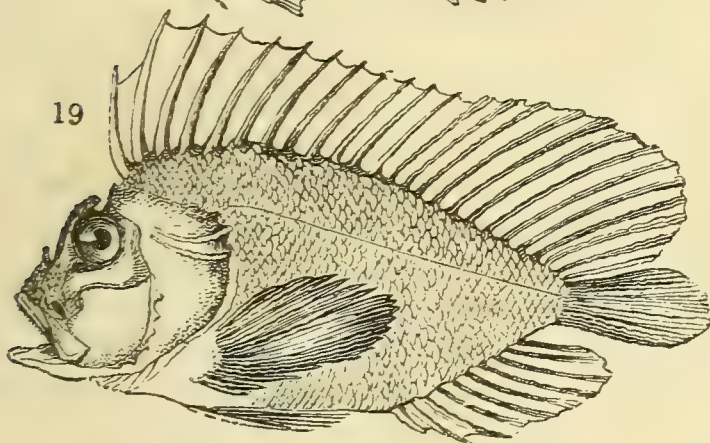
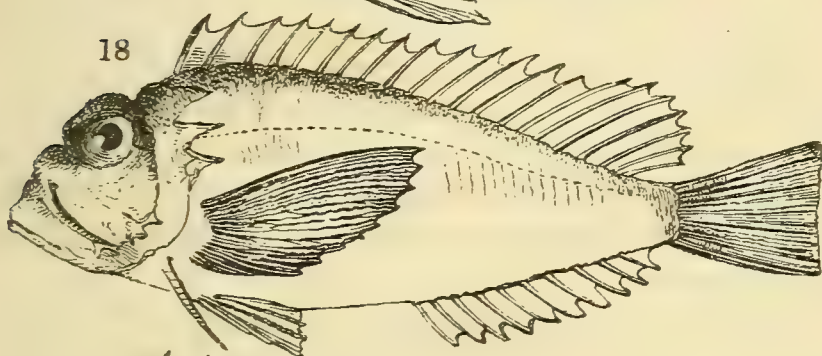
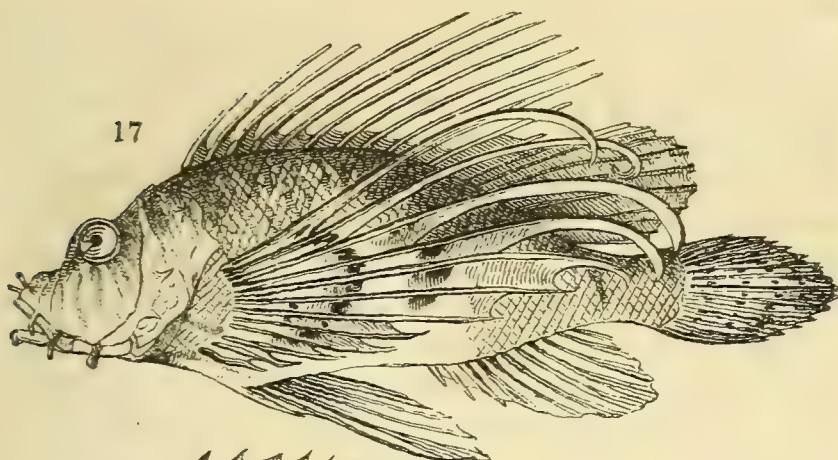


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16





(69.) And now are we to rest here? Can such a system be the work of human invention? If so, those who believe it is, are unwittingly doing us far higher honour than was ever yet bestowed upon the greatest naturalists that ever lived, — or such a system had never been left for us to *invent*. But no; let the glory be His, to whom it belongs. Other branches of human knowledge exalt the creature, because they depend, so to speak, only upon the inventive faculties of man: but in many of the physical sciences it is the reverse; the glory of the wondrous things such researches unfold “is the Lord’s;” and man is but the humble instrument in his hands of making them known. Like the stars of heaven, they remain unchanging and unchanged; and although they may stand open to all, as living but silent testimonies of His hand: they are not so obtrusive, but that they may be disregarded or denied by the careless, the disputant, or the sceptic.

(70.) The great and paramount object with which we began the series of the **CABINET OF NATURAL HISTORY** was to trace, as far as possible, the prevalence of a few general laws of natural classification through the whole range of the animated kingdom of nature. In a former volume we endeavoured to exhibit the study of analogies, not merely under its most captivating form, but as absolutely essential to all those who looked beyond the mere technical surface of Natural History. We are desirous on this occasion, however, to employ, for the same purpose, a strain of eloquence, justness of thought, and soundness of principle, far greater than our own, while the facts we have just adduced are as yet fresh in the memory of the reader.

(71.) “The main prerogative of the human mind,” says the eloquent author of *Saturday Evening*, “is its power of gathering general principles from a multitude of diversified forms or appearances. The pre-eminence of the faculty of generalisation constitutes what is termed the philosophic character. The delight with which minds of this class contemplate universal truths does

not so much spring from perceiving that some general principle holds good and re-appears in a great number of instances that very nearly, or perfectly, resemble one another, as from discovering the occult presence or efficacy of some such principle in a multitude of cases which have few points, or perhaps no other points, of alliance beside this one, of their obedience to the same abstract law. The more there is of external diversity, or unlikeness, among particular instances thus allied by their subjection to a common rule, so much the more of satisfaction and delight will be afforded to the mind when it detects the hidden principle of union. These elements of intellectual enjoyment are richly furnished by the studies of the naturalist. Now, it may be, he compares family with family of the animal and vegetable world ; and, after marking the ostensible peculiarities of each, descends beneath the surface of their external differences, and lays open those great and uniform principles of mechanical or chemical structure to which all are conformed ; and (if the figure may be used) he listens, and hears all beings uttering, in their several dialects, one and the same code of physical existence. The naturalist, after giving a moment to the obvious or common gratification that springs from novelty and diversity, seeks, and soon finds, the more lasting and substantial pleasures of reason, while marking the oneness and harmony of Nature, even where her clothing and her colours, and her proportions, have the least of uniformity. If we might so speak, it is by her *diversities*, her gay adornments, — her copious fund of forms, and her sportive freaks of shape and colour, that Nature allures the eye of man ; while she draws him on to the more arduous, but more noble, pursuit of her hidden analogies. *Unlikeness* awakens his attention ; *uniformity* or simplicity fixes and enchains it ; and by the pleasure it confers, insures, on his part, the laborious investigation of abstruse principles.

(72.) “ While the human mind is thus employed, an insensible process goes on, the effect of which is gra-

dually to invest general truths with a sort of majesty, as well as of beauty ; so that, at length, this new charm rivals and prevails over the graces and attractions of external diversity, and imparts more and more force and advantage to that which is occult, until it quite overpowers that which is superficial. Thus it is, that in the course of philosophical pursuits, abstract principles come forth more and more into the light, stand out with greater distinctness before the mind ; and, ere long, the laws which at first were apprehended with some degree of painful effort, occupy it as pleasant and facile matters in the hour of relaxation, as well as engage it in the season of strenuous exertion. At last, whatever is universal prevails altogether over whatever is individual ; and the rational faculty, getting released from the disturbance of things external or trivial, contemplates with open eye all that is great and permanent." — We now return to our more immediate subject.

(73.) The genus *Apistes* is succeeded by that of *Macrochirus* Sw. of which *Pterois* Cuv. forms a part. The great distinction of all these fishes lies in their enormous pectoral fins and very high dorsals, both of which, in the typical examples, have a number of their rays almost free ; that is, unconnected by any membrane except towards their base. They possess much of the strange and grotesque form of some genera we shall presently notice, without their excessive ugliness, while their rich and varied colouring, disposed in zebra-like stripes on the body, renders them highly elegant and interesting. The whole are natives of the Indian seas ; but none grow to a very large size. Having designated the types of form of Cuvier's *Apistes* as sub-genera, we have done the same with this, its corresponding group ; and although the species yet known are much fewer, we feel persuaded that in a few years these new divisions will be augmented to twice their present limits, and their analogies more clearly determined than at present. Even among those we now know of there is a gradual progression from *Macrochirus* to *Pterois*, where the pectorals are so much abbreviated as to be little more than

one half the typical length. In *Chiroleptus* they are long, but with the rays all united. *Trachipterus* seems a prototype of *Trichosoma* by its low and narrow dorsal fin, while in *Brachirus* the pectorals are again shortened, and the rays connected and branched. We may perhaps be thought to have carried our analysis, or at least our patronymic divisions, rather too far in the two last groups; but it is clear that if we had not done this in the case of *Apistes*, the analogies on which we have so lately expatiated would not have come to light. There is a wide difference between such sub-genera as merely state minute differences, and those which indicate the stages of circular groups, like *Apistes* and *Macrochirus*. We have nothing particular to observe on the remaining genera of the *Scorpænæ*, since their scientific characters will be subsequently detailed. Whether *Trichodon* or *Sebastes* is the intervening form between *Tænianotus* and *Scorpæna* is a secondary question: both are perfect chironectiform types; and we believe the first is the true one of this group.

CHAP. VI.

ON THE TRIBE OF BLENNIDES, OR GOBIES AND BLENNIES.

(74.) THIS tribe, which we have named from the typical family, is composed of those acanthopterygious fishes which have the ventral fins differently constructed, as before observed, from all others of the order. They are either of two or three small rays, or enveloped in a thick skin, or they are united together into a funnel, or finally they are totally wanting. They are besides very remarkable from the rays of their fins being more slender than any of the spiniferous tribes; so that in fact there are few, if any, which possess the strong robust *rigid* spines, so common in the group we have just left; the ventral fins, when they exist, are also generally placed considerably before the pectorals. All these

characters, taken collectively, point out this tribe as a natural group, which is further distinguished by containing the only viviparous genera yet known among the *Acanthopteryges*, and by evincing a clear approximation to the apodal genera or the eel-like fishes. With the exception of the eel-shaped wolf-fish, and the bull-heads (*Batrachidæ*), nearly all the rest are of a small size, neither remarkable for their beauty, nor esteemed as food: the majority only grow to the length of a few inches, and live in very shallow sea water, or in pools left by the sea-side, where they hide themselves from such fish or aquatic birds as prey upon them. In conformity with the result of our investigation of this tribe, we shall divide them into the following families:— The *Blennidæ*, or blennies; 2. The *Gobidæ*, or gobies; 3. The *Batracidæ*, or bull-fish; 4. The *Chiridæ*; and 5. The *Zoarchidæ*, or wolf-fishes. The two first are the typical groups, while it is by the *Batracidæ*, blending into the *Cottidæ*, or bull-heads, that this tribe is united to the last.

(75.) The *BLENNIDÆ*, or blennies, form a most singular and interesting family, very abundant in forms and species, at least in the typical genera. Many of them are found in Britain, where they are called blennies, &c.; but their size is so small, that they are never sold in the markets. It appears that this family is distributed over every part of the world but Asia; or at least it is a singular fact, that, in the two best works we yet possess upon the fishes of India, not one species has been recorded.

(76.) The blennies, as left by M. Cuvier, were distributed under nine genera; but his able coadjutor M. Valenciennes, in his last admirable volume, has added several others, and has enriched our science with such a host of new species, that with these materials, aided by our own, we have been enabled to arrange and work out the relations of this family with an unusual degree of precision. The majority compose two great groups or sub-families — the *Blenninæ* and the *Clininæ*, both

having spinous and soft rays in the dorsal fin, and two or three in each of the ventrals: these are the typical groups: the aberrant, as usual, contain but few species, and those of very diversified forms. These we have arranged under the genera *Ophisomus* Nob., *Cirribarbus* Cuv., and *Opistognathus* Cuv. In the first, the ventrals are almost obsolete, and are indicated by a single ray. In the second, the mouth is cirrated and sub-vertical, the lower jaw being longest; while in *Opistognathus*, which opens a passage to the gobies (*Gobidæ*), the ventral fins are fully developed, and have five rays. These, however, we must now leave, and confine our remarks to the typical groups.

(77.) The *Blenninæ*, or true blennies, as well as the *Clininæ*, possess both spinous and soft rays to their dorsal fin, but the two groups may be immediately distinguished by this very remarkable character, that in the blennies the spinous rays are always fewer than those which are soft; whereas in the *Clininæ*, the very reverse of this proportion is invariably found. From these beautiful and natural characters we immediately obtain the analogical result of the *Blenninæ* representing the malacopterygious order, and the *Clininæ* that of the acanthopterygious. The *Ophisominæ*, with their eel-shaped body and scarcely the vestige of ventrals, represent the *Apodes*. *Cirribarbus*, having a sub-vertical mouth surrounded with cirri, and the lower jaw longest, equally reminds us of *Chironectes*, the type of the *Plectognathes*; while in the blunt, very large, and obtuse head and perfect ventrals of *Opistognathus**, we have a prototype of the *Cartilagines*.

(78.) Leaving these analogies, however, for the present, let us look more closely to the contents of the typical sub-families; and first, of the BLENNINÆ. The genera, with the exception of one (*Chirolophis* Nob.) have all been designated by MM. Cuvier and Valenciennes. In this light do we regard *Salarias*, *Blennius*, *Myxodes*, *Cristiceps*, and *Chirolophis*; while, from their slighter

* "La tête grosse et large." — Valenc. N. H. des Poiss. ii. p.498.

modifications, *Pholis* and *Blennichis* appear to be only sub-genera of the first, and *Petroscirtes* Rüpp. of the second. Omitting these, we shall now show that the remainder represent the five higher groups we have just indicated.

Analogies of the BLENNINÆ.

Orders of Fishes.	Genera of the Sub-family of the BLENNINÆ.	Analogies.	Sub-families of the BLENNIDÆ.
MALACOP.	<i>Blennius</i> .	{ Teeth very strong ; dorsal fins deeply emarginate. }	<i>Blenninæ</i> .
ACANTHOP.	<i>Salarias</i> .	{ Teeth fine, slender ; dor- sal fin of nearly equal breadth, }	<i>Clininæ</i> .
APODES.	<i>Chirolophis</i> .	{ Body anguilliform ; dor- sal and anal fins of equal breadth and very long. }	<i>Ophisomus</i> .
PLECTOGNATHES.	<i>Cristiceps</i> .	{ Mouth sub-vertical ; low- er jaw longest. }	<i>Cirribarbus</i> .
CARTILAGINES.	<i>Myxodes</i> .	{ Head large, elongated ei- ther before or behind. }	<i>Opistognathus</i> .

We have merely inserted the column of the orders of fish to illustrate the analogy of *Myxodes*, the only genus in the whole tribe which imitates the sharks in having the head elongated in front, the muzzle projecting, and the mouth placed beneath. Having detailed all the characteristics of these genera in our systematic arrangement, we shall only at present take a rapid glance at their analogies, leaving the reader to extend them, if he so pleases, to other groups.

(79.) Let us now turn to the sub-family, CLININÆ. These blennies, as already noted, are distinguished, in the first instance, by the spiny rays of their dorsal fin being always more numerous than those which are soft ; whereas, in the last group, this proportion was exactly reversed. In the next place, their teeth are generally of two sorts, so as to unite, as it were, the strong teeth of *Blennius* with the more slender ones of *Salarias*, hereafter mentioned. This character, however, does not pervade the whole group ; and yet, by attending to its modification, we shall find that the difference will lead

to a natural arrangement of the genus *Clinus*, as described by M. Valenciennes. There are more than twenty species, presenting numerous variations in point of structure. If we separate from this assemblage those which have all the teeth velvety, we get two distinct groups, one (*Labrisomus* Nob.) having strong, conic, and pointed teeth on the outer range, while the inner are velvety; and the other, *Clinus* Cuv., where these external teeth are wanting. Other characters drawn from the fins, mouth, &c., determine two other genera, here named *Blennophis* and *Clinitrachus*, and these, united to *Tripterygion* Risso, where the dorsals are three, complete the circle of this sub-family, whose contents and characters may be thus stated:—

Characters of the genera in the SUB-FAMILY of the
CLININÆ.

Genera.	Characters.	Types.
<i>Clinus</i> Cuv.	{ Teeth velvety; those in the front row scarcely, if at all, larger; dorsal fin of nearly equal breadth throughout.	{ <i>Clinus acuminatus</i> C. and V.
<i>Labrisomus</i> Nob.	{ Strong conic and pointed teeth in the front row, velvety teeth behind; dorsal fin emarginate behind.	{ <i>C. pectinifer</i> C. V.
<i>Tripterygion</i> Risso.	{ Dorsal fins three; muzzle pointed.	
<i>Clinitrachus</i> Nob.	{ Trachiniform; dorsal fins two, the first triangular; all the rays of the dorsal, anal, pectoral, and caudal fins spinous.	{ <i>Blennius variabilis</i> Raf.*
<i>Blennophis</i> Nob.	{ Anguilliform, cylindrical; the dorsal long, narrow, and undivided.	{ <i>C. anguillaris</i> C. V.

Now, as the first and the last of these forms are in the suite of M. Valenciennes's series of the genus *Clinus*, their affinity cannot be questioned. He remarks also on the strong resemblance between *Clinitrachus*

* *Clinus argenteus* C. V. I adopt Rafinesque's specific name, because it is more expressive, and has the priority of a few months to that of Risso. It is one of the most common species on the Sicilian coast.

and *Tripterygion*, which passes into *Labrisomus* by *L. Delalandii*, a fish having three sinuities on its dorsal, representing the three distinct fins of *Tripterygion*. Thus we have a perfectly circular succession of the whole, in which not a single link can be said to be wanting. Our arrangement, therefore, rests on *affinity*: let us now look to *analogy*. The *Blenninæ* and the *Clininæ*, if they are natural groups, will correspond in all their subordinate divisions, and that not vaguely, but definitely; because, as they are *closely* related, their analogies should be strong in the same proportion.

Analogies of the CLININÆ and the BLENINÆ.

Genera of the <i>Clininæ</i> .	<i>Analogies.</i>	Genera of the <i>Blenninæ</i> .
LABRISOMUS Nob.	{ Anterior teeth very strong; dorsal fins deeply emarginate.	} BLENNIUS Linn.
CLINUS Cuv.	{ Teeth very fine; dorsal fin of nearly equal breadth throughout.	} SALARIAS Cuv.
BLENNOPHIS Nob.	{ Body anguilliform; dorsal and anal fins linear, equal and reaching to the caudal.	} CHIROLOPHIS Nob.
CLINITRACHUS Nob.	{ Mouth sub-vertical; dorsal fins two, the first of three rays; lower jaw longest.	} CRISTICEPS Cuv.
TRIPTERYGION Ris.	Muzzle elongate.	MYXODES Cuv.

The most remarkable feature, perhaps, of this table is, that the *analogical* characters are almost word for word the same as those which designate the absolute *generic* characters of these groups, omitting only those which especially mark the distinction between the two columns or sub-families; so that, in fact, if these are set aside, there is no possible way of separating the one from the other.

(80.) As *Labrisomus* and *Clinus* are thus shown to be typical genera, still possessing several singular, although subordinate variations in form, it follows that they contain the types of sub-genera; these, however, are not all discovered, and, having gone thus far, we shall not

designate by patronymic names those that appear to be of this description. The researches of naturalists and collectors, in some ten years hence, will probably double the number of species now known. In the mean time, however, it is not a little remarkable, that those types of form, or of sub-genera, which are necessary to connect *Tripterygion*, *Labrisomus*, *Clinus*, and *Blennophis*, may actually be traced in the admirable descriptions of M. Valenciennes: his *C. Delalandii*, for instance, has the dorsal fin imperfectly three-cleft; while in *Tripterygion* these clefts are so deep as to divide the dorsal into three distinct fins. The passage from *Labrisomus*, on the other side, is marked by *L. Gobio*, which, according to our observing author, is “remarkable for its thick and wide head*”; and he names it accordingly: this form is immediately met by another in the adjoining genus of *Clinus* (as now restricted); namely, the *C. cottoides*, which he considers to bear precisely the same relation.† Now that these two fishes, so resembling each other, nevertheless stand at the approximating confines of two different genera, will be established on the very same authority. The teeth of the jaws in *C. Gobio*, our author describes as “petites, coniques, et pointues; la supérieure en a 26 égales, et qui vont jusqu’ à la commissure; l’inférieure n’en a que seize, qui n’occupent de chaque côté que moitié de la longueur, et dont les deux dernières sont plus grosses, et plus crochues.” This is precisely in accordance with the characters we have assigned to our genus *Labrisomus*. Of the *Clinus cottoides*, on the other hand, it is asserted that, “Les dents sont en velours, sur des bandes assez larges; le rang extérieur diffère à peine des autres.” It should be especially remarked, that the passage of these two groups, thus effected, takes place by means of two thick-headed fishes (the only ones in their respective genera), just as the *Cottidæ* pass into the *Batrachidæ*, and connect the

* “Sa grosse et large tête, qui, à la première vue, la ferait prendre pour notre cotte de rivière (*Cottus Gobio*).” — Hist. Nat. des Poiss. xi. 395.

† “Les inégalités de sa tête donnent à cette espèce, au premier coup d’œil, quelque ressemblance avec les Cottés.” — Ib. p. 367.

two tribes of *Canthileptes* and *Blennides*; all being cartilagiform or fissirostral types.*

(81.) The reasons, however, which have guided us in not yet venturing to name the sub-genera of *Labrisomus* and *Clinus*, are not applicable to *Blennius* and *Salaria*, which are the two typical genera of the *Blenninæ*, and these we shall now consider. Four of the sub-genera of *BLENNIUS* have already been determined, and many species described, by M. Valenciennes: it remains only for us to designate that of *Blennitrachus*, which, as intervening between *Chasmodes* and *Blennichis*, completes the circle of this genus, and gives us a uniform representation of all the groups just enumerated. This type is furnished by the *Pholis quadrifasciatus* of Wood†; which M. Valenciennes, with some hesitation, admits into his genus *Chasmodes*, observing that it differs in having canine teeth, and in the dorsal and anal fins not being joined to the caudal: the original description, however, furnishes us with another character of equal importance, that of the lower jaw being longest: now this is precisely the character wanted to show its relation to *Clinitrachus*, *Cristiceps*, *Cirribarbus*, and all other groups, large or small, which represent *Trachinus* and the *Chironectidæ*. A glance at the figure of this singular fish, as figured in another part of our volume, which seems to be American, will satisfy the ichthyologist on this point: the head, indeed, is perfectly analogous, but the dorsal fin is not, to *Clinitrachus*.

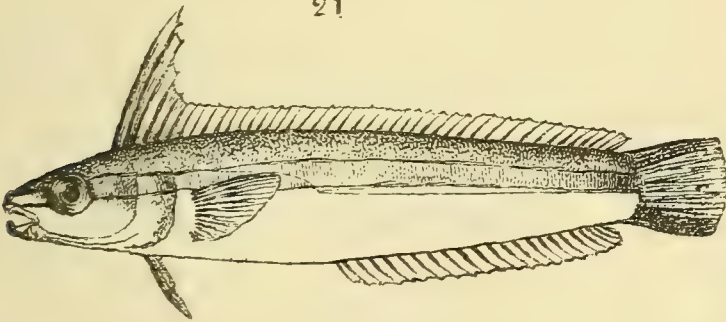
(82.) The genus *SALARIA* of M. Cuvier forms another typical group of the *Blenninæ*, and likewise contains its subordinate types, only one of which has been named. The whole form a singular collection of small fishes having the general form of the common blennies, but characterised by a great peculiarity in their teeth: these are particularly slender, very numerous, and so slightly fixed at their roots, that, to use M. Cuvier's ex-

* Corresponding to the aquatic type among quadrupeds and the natorial division of birds: all having unusually large heads.

† Amer. Trans. iv. 282. pl. 17. fig. 1.

pression, they may be moved by the fish, independently of each other, like the keys of a harpsichord: they are nearly all from the Indian Ocean, and present two distinct modifications. In the sub-genus *Salarias* Cuv. properly so called, the dorsal fin is high and deeply cleft; and the sides of the mouth are generally furnished with strong canine teeth: but in *Erpichthys* Nob., the dorsal fin is nearly of equal breadth throughout; and the canines are wanting: many species arrange themselves under each of these, which appear the two typical sub-genera. The next is *Rupiscartes*, at once distinguished by having an eel-shaped form, and four rays to its ventral fins; a structure without example in this family except only in *Opistognathus*. The fourth is *Cirripectus*, which shows us the chironectiform type, in its semicircle of tentaculi, or cirri, round the mouth and nape, analogous to *Cirribarbus*. Lastly comes Dr. Rüppel's sub-genus *Petroscertes*, joined indeed to *Blennichus* by M. Valenciennes, but at once distinguished by a single series of small setaceous teeth, without the large canines of *Omobranchus* Ehr. (*Blennichus* Val.): this form, in short, as seen in *O. filamentosus* (fig. 21.), connects the

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genus *Salarias* in the most perfect manner with that of *Blennius*. It thus appears, that the sub-genera of *Salarias* and *Blennius* not only represent each other, but also show us a series of analogies to the *Blenninæ* and the *Clininæ*; a fact which will be at once apparent, if we arrange all these in columns, and compare those groups which stand opposite to each other.

Analogies of the Sub-genera of SALARIAS and BLENNIUS.

Orders of Fishes.	Primary Division of the <i>Blennidæ</i> .	Sub-genera of <i>Blennius</i> .	Sub-genera of <i>Salarías</i> .	Genera of the <i>Blenninæ</i> .	Genera of the <i>Clininæ</i> .
MALAC.	BLENNINÆ.	Blennius.	Salarías.	BLENNIUS.	LABRISOMUS.
ACANTH.	CLININÆ.	Pholis.	Erpicthys.	SALARÍAS.	CLINUS.
APODES.	OPHISOMUS.	Chasmodes.	Rupiscartes.	CHIROLOPHIS.	BLENNOPHIS.
PLECTO.	CIRRIBARBUS.	Blennitrachus.	Cirripectus.	CRISTICEPS.	CLINITRACHUS.
CARTIL.	OPISTOGNATHUS.	Omobranchus.	Petroscertes.	MYXODES.	TRIPTERYGION.

(83.) The experienced ichthyologist, conversant with the typical forms of these groups, will need no further illustration than what we have already offered in the foregoing pages; while, to render it equally clear to the student or general reader, would require much more space than we could possibly spare. One or two additional remarks, however, will serve to show the value of the whole. The groups in the line opposite the *Apodes*, are all eel-shaped fishes: those opposite the *Plectognathes* turn out to be all of the chironectiform type, having obliquely vertical mouths, often with cirri or barbels, longer under jaw, &c.; while the great-headed groups, and such as have the mouth beneath, stand opposite to the *Cartilagines*. Soft rays predominate in those which are on a line with the *Malacopteryges*, while in such as follow the *Acanthopteryges* the spinal rays predominate.

(84.) The GOBIDÆ, or gobies, form a much less diversified family than the last; and their variations in consequence are so few, that we shall make no attempt in this place to determine their natural arrangement. They are all very small-sized and insignificant-looking fishes, the largest seldom exceeding a foot in length, while the majority usually attain only a few inches. They are immediately distinguished from the last family, by having the ventral fins fully developed, and generally so united as to form a funnel or sucker, analogous to the cyclopteros, or sucking fishes, by which they are enabled in the same manner to affix themselves to other substances: even in such genera as have not these two fins absolutely united, the slenderness and flexibility

of the spinal rays—the grand distinction of this tribe—will always prevent the gobies from being confounded with any other spiniferous group. Several species are found on our own coasts, and they are excessively abundant in the Mediterranean, living, like the gobies, in shallow and quiet inlets or harbours, among sea-weeds. They are said by Olivi, a Venetian naturalist, to excavate burrows in the mud or clay at the bottoms, where they pass the winter. In spring, they construct a nest in some spot abounding with sea-weed, which they afterwards cover with the roots of the *Zostera*. Here the males remain, and await the females, who successively arrive to deposit their eggs: these, after fecundation, are taken care of by the males, who exhibit much care and courage in preserving and defending them. M. Cuvier is of opinion, that the goby, in fact, is the *Physis* of the ancients, which, as Aristotle remarks, is the only fish that constructs a nest. Nearly all the usual variations of form, corresponding to the primary types among fishes in general, will be found in this family. *Periopthalmus* C., an Indian group, gives us the small vertical eyes of the chironectiform type. *Tænisoma* Nob. is a representative of *Cepola*, and the riband-fish; *Eleotris* has the ventrals disunited, and thus makes the nearest approach to the *Blennidæ*; while *Comephorus*, by being destitute altogether of ventrals, shows us the apodal or anguilliform type. The *Gobinæ*, as already intimated, stand at the head of this family: the other chief group being represented by the genus *Callionymus*, or dragonets: here the ventral fins are even larger than in the gobies, for they exceed the pectorals, but although close together they are not united: they are also small fishes, often of very beautiful colours, but slimy and unpalatable. Their whole shape and aspect is so very like that of the *Triglidæ*, or gurnards, that we can be at no loss to determine their analogical relations: like them also, and several of the gobies, the branchial aperture is reduced to a spiraculated orifice, similar to that of the *Apodes*, which this

tribe represents ; but then the skeleton is truly osseous, and the relation is obviously one only of analogy.

(85.) Of the three aberrant divisions, or families, of this tribe, namely, the *Batrachidæ*, the *Chiridæ* and the *Zoarchidæ*, the examples are very few. *Comophorus*, by its broad and depressed muzzle, seems to connect the gobies with the *Batrachidæ*; but these latter are so little understood, that, perhaps, the less we say about them the better. The fact seems to be, that M. Cuvier, like all his predecessors, by mistaking analogy for affinity, has mixed up the *Lophidæ*, or such as have a sub-cartilaginous skeleton and pedunculated pectorals, with such of the true *Batrachidæ* as have an osseous skeleton and sessile pectorals, that is, pectoral fins, formed, as in all the osseous tribes, in the ordinary manner.

(86.) The *Zoarchidæ* comprise a very few blennies, having eel-shaped bodies, but destitute of ventral fins. The type is a well known fish, common to our northern seas, and known by the name of the cat, or wolf-fish (*Anarrhichas lupus* L.*); it exceeds all the other blennies in magnitude, being sometimes found above seven feet long. It is common in Scotland, where it is generally known by the name of cat-fish ; the flesh is much esteemed, but, as the skin is unusually tough, it is always taken off, as in eels, before cooking. It is, in every respect, the shark of this tribe, for its habits are fierce and ravenous, and its mouth is beset with numerous and formidable cutting and grinding teeth ; it lives, however, chiefly on crabs and shell-fish, and is not known to attack men. Lastly, as connecting these fishes to the true blennies, with which we began our survey, there is the genus *Zoarchus*, having the dorsal, anal, and caudal fins blended into one, with the vestiges of ventrals. The American species grow to nearly the size of the cat-fish ; but that found on our own coasts (*Zoarchus viviparus*) is generally not longer than fifteen inches. The close

* Yarrell, i. 247.

affinity which this species bears to our sub-genus *Ophi-somus* among the *Blenninæ* is too obvious to be dwelt upon.

(87.) The *Chiridæ* we have formed of a very singular and apparently anomalous genus, that of *Chirus* Steller, of which several species are found in the frigid seas of Northern Asia. Cuvier places this genus at the end of the Blennies, and M. Valenciennes regards it strictly in the same light. In this he may possibly be correct; but if so, it can be no other than the most aberrant group; for notwithstanding several points of resemblance to the blennies, the ventral fins are quite developed, and are not placed, as is usual, *before*, but *under*, the pectorals. We therefore arrange *Chirus* for the present at the end of this tribe, and with the same doubts as M. Cuvier originally entertained regarding its true situation. It must either be the most aberrant type of the blennies, or represent them in the circle of the *Percidæ*, just as *Sparus* does in that of the *Chætodonidæ*. We shall now proceed to another class of animals in the great circle of the Vertebrata.

CHAP. VII.

ON THE CLASS AMPHIBIA, OR THE AMPHIBIANS.

(88.) THE application of the term *Amphibians*, in popular language, is much more general than that in which it is used by zoologists. An amphibious animal, generally speaking, is one which is capable of inhabiting both the land and water, and the term, as being expressive, should by no means be abolished. But the animals to which naturalists have more particularly applied this name, belong exclusively to such vertebrated reptiles as not only possess the power of living

in two elements, but which, during life, undergo a metamorphosis. Linnæus indeed placed in his class *Amphibia* not only the semi-aquatic reptiles, and the frogs, but the whole of the terrestrial lizards, and serpents, adding thereto the sharks and a large number of true fishes. But modern naturalists have reduced this heterogeneous assemblage to more order; and although M. Cuvier, by a singular oversight, has not retained a name so expressive, our best erpetologists now agree in restricting the term to the frogs, the salamanders, and the sirens. These, as it has long ago been proved, form a distinct natural class of vertebrated animals, intervening between fishes and the true reptiles, and to which alone we must be considered to allude in this chapter.

(89.) “The doctrine of continuous affinities,” observes Professor Bell, “could scarcely receive a more striking illustration in the animal kingdom, than is afforded by the interesting group constituting the AMPHIBIA of modern authors. Intermediate in their structure, and, in many forms, in their habits and modes of life also, between the fishes and the true reptiles, they bear a still more interesting relation to those classes in that remarkable change which many of them undergo at a certain period of life, by which they become transformed from the nature and habits of the former to those of the latter class; and thus exhibit, in their own individual life, a beautiful and complete example of *transition of organisation*, a subject which constitutes one of the most important theories connected with the higher departments of zoological science. To any person capable of appreciating the interest attached to the study of physiological phenomena, the contemplation of an animal, which at one period of its life is endowed exclusively with the organs of aquatic respiration, resembling the gills of fishes, with means of locomotion adapted only to a constant residence in water, and with a digestive apparatus fitted exclusively for the assimilation of vegetable food, assuming by degrees the

function of atmospheric respiration, acquiring limbs which are formed for leaping on land with great strength and agility, and manifesting the most voracious carnivorous appetite, will not only excite feelings of the deepest admiration, but necessarily lead to the investigation of the laws by which such extraordinary changes are governed, and of the relations which they bear to the theory of continuous affinity before alluded to, no less than to that of *progressive developement* through the whole of the animal kingdom.”*

(90.) The general peculiarities of this class, small indeed in its numerical amount, but characterised by several remarkable circumstances, may be thus stated, in reference to their distinction from fish and reptiles. The skin is soft and naked, being destitute of either scales or plates; and nearly all undergo metamorphosis, the young respiring by external branchia, and the adult by internal lungs. With the exception of the frogs, they have much of the form of lizards, with in general four feet, and a lengthened tail.

(91.) Passing over the various artificial arrangements of this class, as unimportant to the paramount object of our volume, we rejoice in being able to avail ourselves, in this part of our undertaking, of the labours of one of the most eminent erpetologists in Europe; who, thoroughly impressed with the truth of that circular arrangement, which, if it pervades one class of animals, must necessarily pervade all, has distributed the *Amphibia* in accordance with such a series; and we deem his labours so successful, that we shall not venture to hazard the least alteration of our own. In a valuable work not particularly devoted to Zoology†, Professor Bell has arranged all the amphibians yet known under the following orders:—1. *Amphipneurta* contains the sirens and proteans; 2. *Anoura*, comprehends the frogs and toads; 3. *Urodela* includes the salamanders;

* From the author's beautiful History of British Reptiles, p. 72, 73.

† The Encyclopædia of Anatomy and Physiology, part i. p. 91.

4. *Abranchia* has the genera *Menopoma* and *Amphiuma*; while 5. contains the singular genus *Cæcilia*. It is easy to perceive that this last passes into the first by means of the dipod sirens, and thus the whole form a circular group more or less perfect in its connecting links.

(92.) If we look to those groups of the amphibians in the foregoing arrangements which exhibit the most perfect metamorphosis, or, in other words, the highest development of those characters which separate this class from the true reptiles, we find they are exemplified in the frogs and salamanders; for, although the first of these never possess a tail in their adult state, while this member is permanently retained by the salamanders, yet these are the only amphibians yet discovered, whose respiration is totally different in their young and in their perfect state. As tadpoles, they live in water, and breathe by external branchia; but, when matured, they respire atmospheric air and breathe by cellular lungs. There can be no doubt therefore, that these two groups follow each other; and we are strongly inclined to believe, with Professor Bell, that they are the two typical groups of the whole class. In this case the three other orders of his arrangement, viz. the *Abranchia*, the *Amphipneurta*, and the *Apoda*, necessarily constitute the aberrant divisions.

(93.) The order BATRACIA (*Anoura* B.) contains the whole of the frogs and toads. To describe the form of animals so familiar to every one will be unnecessary. One of their most striking peculiarities consists in their progressive motion upon land, being effected by leaping; while the frogs, from the length and shape of their feet, are also able to swim with great alacrity. Their metamorphoses are more perfect than that of the salamanders, because the change of their form is much greater: hence they may be considered the pre-eminent type of the whole class. Their heart has but a single auricle and ventricle, and they have two equal lungs: to these

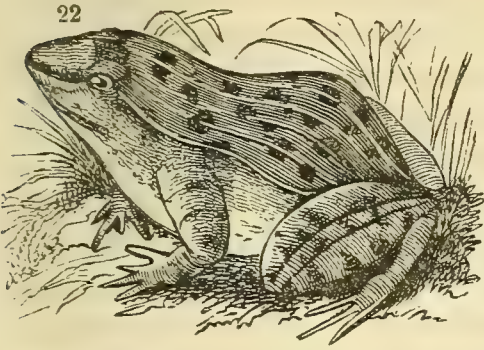
are united, in their early age, branchia or gills, which are subsequently lost. The young are called tadpoles, and are to be seen in all ponds and still waters during summer: in this state they are provided with a tail, something similar to that of fishes; but this also is lost in the adult, since no vestige of this member has yet been discovered in any of the species of full-grown frogs. The body, as in all the amphibians, has neither scales nor plates, but is covered by a cold naked skin, and there are no traces of ribs. The vital principle in these reptiles is nearly as great as in the tortoises, and they are killed with much difficulty. The heart contracts and dilates a long time after the death of the animal, even after it has been extracted from the body. There is, however, such cold-blooded cruelty in the experiments which have been made upon these harmless beings, that we shall neither disgust our readers by further details, or perpetuate the shame of those whose philosophic barbarity has furnished them. Much has been said about frogs and toads remaining enclosed in hollows of trees, and even in solid marble; but the vulgar are prone to believe the marvellous. That some of these animals remain in a torpid and death-like sleep during winter is well known; and this lethargy is so profound, that Hearne, in his voyage to the Icy Sea, mentions his having found frozen frogs who exhibited no signs of life when their legs were broken, although they resumed their natural movements when exposed to a genial heat. During this lethargy it might possibly happen that the aperture, by which the animal crept into its winter retreat, would contract so much from natural or other causes, that the reptile could not force itself out by the same passage at the return of spring: it would therefore remain enclosed; and as we know that all hybernating animals can remain without food for a considerable time, it is not at all surprising that frogs and toads should be found alive, so enclosed, without the power of deriving nourishment. But even

this faculty of abstinence is limited. Out of three toads shut up in sealed boxes by a French experimentalist, one was found dead at the end of eighteen months, and the two others were in a very languid condition—a clear proof that they would soon have shared the fate of their companion. Until, therefore, some of these marvellous stories are authenticated by the testimony of naturalists who have actually seen living toads cut out of solid trees and stone walls, we must withhold our belief from the fact, viewing all these narratives as exaggerated representations of the possible case we have just instanced.

(94.) The sub-divisions of this order are not many, originating in the comparatively few deviations from the typical forms observed in the existing species. The natural arrangement of all groups so situated is peculiarly difficult; and, as their circular affinities have not yet been investigated, we shall merely notice them in the order in which they stand in the *Règne Animal* of M. Cuvier. The two principal divisions are the frogs (*Ranidæ*) and the toads (*Bufoïdæ*), both comprehending several smaller groups; while, of those which remain, the cell-backed toad (*Pipidæ*) is the most remarkable.

(95.) *The Frogs* (*Ranidæ*) are chiefly distinguished from the toads by the unusual length of the hind feet, which are strong and well palmated: hence their great power both of jumping and of swimming: their skin also is smooth, and there is not only a row of small fine teeth round the upper jaw, but the palate also is furnished with another range, placed transversely. It is one of the many singularities attending these animals, that while in the young or tadpole state they are herbivorous, living only, according to Cuvier, upon aquatic plants, yet no sooner do they effect their metamorphosis than they become carnivorous, pursuing insects, slugs, and similar animals, and feeding upon them whether alive or dead. The eggs or spawn, as they are usually called,

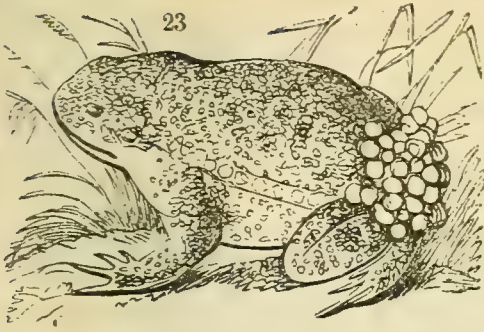
are deposited in lumps in marshy waters. The green frog (*Rana esculenta*) and the common frog (*R. temporaria*) are familiar examples, while *Cyst. pachipus* (fig. 22.) is remarkable for its thick feet. The genus *Ceratophris*, or horned-frogs, designates a very peculiar group, found only



in tropical America ; whose appearance is rendered still more grotesque, if not hideous, by each eyelid having an elevated prominence like a horn ; the head is disproportionately large, and the skin is frequently granulated. Africa also possesses a peculiar race of frogs, which, from having some of the toes enveloped at their tips by a conical horny claw or cap, have been aptly termed *Dactylethræ*, or thimble-frogs. The *Hylæ*, or tree frogs, are not only a very singular group, but, from the elegance of their colouring, joined to a diminutive size, may be really termed beautiful. Although they lay their eggs in the water, and even hibernate in the mud during winter, they habitually live among trees, which they are enabled to climb with facility by the peculiar construction of their toes. We have a very pretty example of these little animals in the European tree frog (*Hyla arborea*) ; but those of tropical America are much more numerous, and are ornamented with the most pleasing mixture of colours.

(96.) *The Toads* (*Bufoïdæ*), although a perfectly harmless and inoffensive race, are certainly uninviting, not to say disgusting animals, to mankind in general ; having neither the beauty of snakes, the elegant movements of lizards, or the sprightliness of frogs. Their body, of a dull cadaverous hue, is covered with granular warts, and even their movements are so slow and awkward, that they almost appear to be attended with painful effort.

Yet, if with these prejudices to contend against, an observer of nature will have the courage to place one of these poor creatures in such a position as to examine its eye, his disgust or repugnance will be turned into pity and compassion ; and he will wonder how such an expression of mildness and patient endurance could beam from the eye of a being to which nature has given a form so repulsive, and which ignorance has invested with venomous malignance. There is not, in fact, the least shadow of truth in these fabulous accounts of the venom of the toad, notwithstanding the authority of Shakspeare, or the day dreams of the old naturalists. But to resume : toads are destitute of teeth ; their gait is slow ; they leap badly ; and seldom frequent the water but to deposit their eggs : they are, essentially, nocturnal animals, concealing themselves, for the most part, during the day, among sheltering herbage, and only issuing forth, at twilight, to feed upon slugs and similar things. Its hybernation is passed on land, either in holes of walls suited to its habits, or in little burrows, which it excavates beneath the surface. Considering its size, it is a long-lived animal, attaining to fifteen or sixteen years, and producing young the fourth year. We have not heard its cry, which has been likened to the feeble barking of a dog. Some of the European toads (*G. Bombinator* Merr.) have the tympanum of the ear concealed under the skin ; and others, inhabiting tropical America, forming the genus *Oxyrhynchus* Spix (a name, by the way, previously used in Ornithology), have the muzzle of the mouth pointed. Two other genera appear intermediate between this last and the *Pipa*. One of these (*Otilophes* Cuv.) has the muzzle of an angular shape, and one side of the head is ornamented with a crest, which extends over the parotid. The other genus (*Breviceps* Merr.) is remarkable for having no visible indication of the tympanum or parotid : the body is oval, the head and mouth very small, and the feet but slightly pal-mated. Lastly, the *Bombinator obstetricus* is remarkable

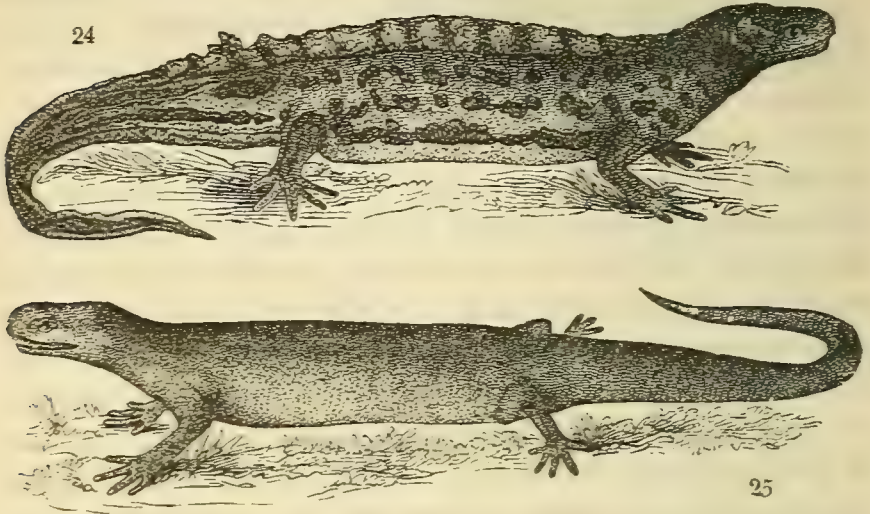


for carrying its eggs upon its back (*fig. 23.*). The *Pipa*, or Cell-bearing toad of Surinam, is evidently allied in general form to the reptiles last mentioned ; yet it differs in some very remarkable characters.

The species best known is sometimes called the Surinam toad, and this is the type of the genus. It is a hideous, but a most singular animal, of a dark brown colour, covered with reddish tubercles, and grows to six or eight inches in length. Nature seems to have bestowed upon the female an extraordinary power of protecting its young. So soon as the eggs are deposited upon her back, by the assistance of the male, she hastens to the water, where her skin swells, and forms little round cells, into which the eggs sink : the young, at the time of their birth, have a little tail, which they retain so long as they remain in their cells, wherein they seem to perform their transformation. So soon as their feet become developed they are left by their mother, as able to provide for their future sustenance.

(97.) In the brief notices to which we must confine ourselves regarding the remaining amphibians, it will be as well to follow the order in which they stand in the *Règne Animal*, with the exception of adding thereto the singular genus *Cæcilia*, which we agree with Mr. Bell in placing as the most aberrant type of the true amphibia. They will therefore be enumerated as follows :—1. The *Salamanders*, either terrestrial or aquatic ; 2. The *Protean reptiles*, all of which, like the last, have four feet, excepting the sirens, in which the hinder pair are entirely wanting ; and 3. the *Cæcilia*. The *Salamanders* (*fig. 24, 25.*) have the general form of lizards, but without their scales. The head is greatly flattened, the ear concealed beneath the skin, and the two

jaws furnished with numerous small teeth. Similar teeth are also in the palate, and the tongue resembles that of the frog. In the young state they are tadpoles, and the front feet are developed before the hinder pair make their appearance. These reptiles are divided into such

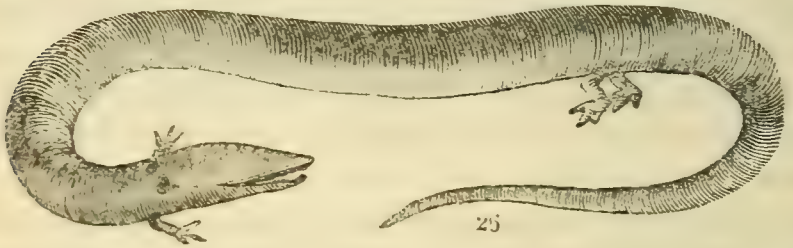


as frequent the land, and such as live in fresh waters. The land salamanders (*Salamandra*, fig. 25.) are known in their adult state by having a cylindrical or rounded tail, although in their early state the tail of the common species (*S. maculosa*) is vertically compressed, and the respiration is by gills. It appears indeed that, notwithstanding their name, the land salamanders are all inhabitants of water before they acquire their perfect growth, and that they again frequent that element to deposit their young. During the day, these creatures may be found in damp and humid places, particularly at the edge of walls or other buildings, hid among the rank grass, for in such situations their food, which chiefly consists of slugs and worms, is more readily procured. To this division belongs the animal so celebrated by the ancients for its fancied resistance of fire, a fable which probably had its origin in the circumstance of the salamander being able to emit in time of danger an acrid milky fluid, which oozes from a range of tubercles placed on the sides of the body.

This liquor is stated to emit a powerful odour and to be even poisonous to small animals. There are but few of these reptiles in Europe, but many have of late years been discovered in America, and have been accurately described by the naturalists of the New World. They seem to differ but little from those of Europe, except in wanting the glands on the occiput. The aquatic salamanders (*fig. 24.*) form a natural division from the last, since they pass almost their entire life in the water, and consequently their tail, which in that element is their chief organ of locomotion, is always vertically compressed or oar-shaped. The cruel experiments of the Italian naturalists on the extraordinary power of reproduction possessed by these harmless little creatures need not be detailed. The eggs are laid in the water, in the same manner as those of frogs, and the young come forth in about a fortnight. In the spring, which with all animals is the season of love, the male salamanders have crests and other little ornamental appendages, no doubt to attract the female, since they are not retained beyond that period. Several of these species, but all of a small size, inhabit the fresh and stagnant waters of Europe, and some are found in this country. The toes in this group vary both as to their number and connection, from which circumstance the different sub-genera have been formed. Many of this division inhabit North America, while M. Cuvier is of opinion that the famous fossil skeleton of *Œningen*, supposed by Scheuzer to have belonged to the human species, is nothing more than the remains of a gigantic salamander measuring more than three feet in length.

(98.) Immediately after the salamanders, M. Cuvier placed two remarkable genera of amphibians, agreeing with the former in possessing (as he conceived) gills only in an immature state. But subsequent discoveries sanction the idea that they do not undergo metamorphosis, but respire all their life by lungs only. Mr. Bell has therefore formed them into a separate order, which he has named *ABRANCHIA*. The genera alluded to are

Menopoma and *Amphiuma*, both peculiar to North America. The first consists but of a single species, called the great American salamander, which attains the length of eighteen inches. In addition to the usual range of teeth in the jaws, it has another parallel row on the front of the palate. We owe to Dr. Harlan, the most eminent of all the American erpetologists, a highly valuable account of this singular animal. Dr. Garden, another observing naturalist of the Western World, discovered the genus *Amphiuma*, a peculiarly interesting group, as showing a strong relation between the salamanders to the sirens. There are two species (*Amph. tridactylum* (fig. 26.) and *means*), differing only



in size and the number of their toes. Both have a very long body, giving them the appearance of eels, while their legs and feet are so very short and slightly developed, that they appear useless.

(99.) The true Amphibia are those which breathe not only by lungs but by gills, the latter being always retained as permanent and essential members during the whole of life, and not cast off, as in the salamanders, so soon as the animal arrives at maturity. Of these animals M. Cuvier justly and truly observes that “they alone must be regarded as the only vertebrated animals which are truly amphibious,” and hence we have always had a strong suspicion that they constituted the typical perfection of this class. The leading genera are four.: — *Phylhydrus* (formerly denominated by Shaw, *Siren pisciformis*); 2. *Menobrachus*; 3. *Proteus*; and 4. *Siren*. As a mere technical description of the external characters of these remarkable animals would

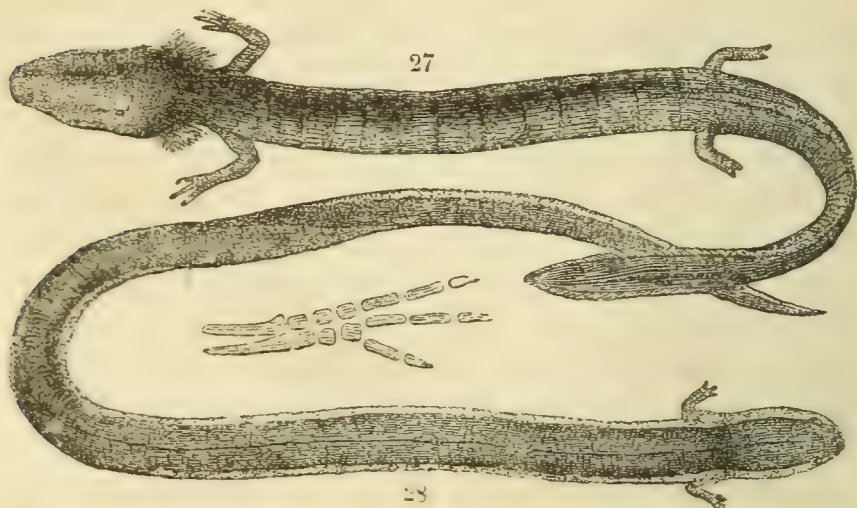
give no adequate idea of them to the general reader, we shall here briefly notice their general structure and habits. These constitute Mr. Bell's order *Amphipneurta*.

(100.) The *Phylhydrus pisciformis* of Brooks is sometimes designated by the barbarous and unutterable name of *Axolotl*, given to it by the Mexican Indians. We shall term it the Mexican siren, since it obviously belongs to the same group as that of America, or it may be called the axolot. This singular animal is abundant in the lakes close to the city of Mexico, but its habits, we believe, have never been detailed. In its general form it perfectly resembles the young or tadpole of the aquatic salamander. It has four feet, the first pair with five, the hinder with four, toes on each. Its colour is deep greyish black, which, with the three long gills on each side, divided into tufts of filaments, gives it a most repulsive and forbidding aspect. It is, however, perfectly harmless, and seldom exceeds seven or eight inches in length. We believe Dr. Shaw was its first describer, but both Humboldt and Horne have given additional figures and descriptions of it.

(101.) The *Menobrachius* of North America, if we mistake not, is another of the important discoveries of Dr. Harlan. It inhabits the lakes and large rivers of North America, growing to the length of two feet, and it is said to be carnivorous and gluttonous. It has four feet, and the same number of toes upon each, but is without claws. To this species (*M. lateralis*) Dr. Harlan adds another, called by Lacepede *Proteus tetradactylus*: he also considers the Mexican siren as belonging to this genus*, viewing it as an aberrant example. The genus *Proteus* is represented by a single species, which is one of the most extraordinary animals of Europe. Its general form is much like the American type last described; but it has only three toes on the fore feet, and two behind: the feet are very small, and the

* See Trans. of Am. Soc. v. 324.

tail is natatorial, or vertically compressed. Besides the internal lungs, it has three gills on each side the head, of a coral-red colour, formed like tufts of filaments. It has no teeth; and the eyes, which are excessively small, are concealed by teguments; the ear, also, is covered, and the skin is smooth, cream-coloured, and viscid. It was supposed, for a long time, that this curious reptile was only found in a particular lake in Carniola; and that it was the larva or tadpole of some reptile, which, in its adult state, had not yet been described. Repeated investigations, however, have proved the fallacy of both these opinions. The *Proteus* has been found in other parts of Germany; and the anatomical observations of various naturalists have established it as a perfect and adult animal, differing materially in its skull from the salamanders, and presenting an intermediate structure between them and the American sirens. It is a singular corroboration, also, of this opinion, that in the district of Carniola, where it is mostly found, no salamander is known from which it could possibly proceed; nor any with the true larva of which we are not perfectly acquainted.* As the feet are very small and feeble, the *Proteus*, as may be expected, walks badly; but its natatorial tail enables it to swim extremely well.



* Grif. Cuv. p. 476.

Its size is small, and its thickness not equal to that of the little finger. The sirens of North America, on account of the similarity of their respiration, are arranged by Mr. Bell in the same order as the last. These singular creatures, which, with the former, were once supposed to be the tadpoles of some unknown reptiles, are now known to be perfect “after their kind;” and to be provided at all periods of their existence with external branchia and internal lungs. They are, however, readily separated from the amphibians already mentioned, by having only two fore feet, the hinder ones being altogether absent; neither is there any vestige of a pelvis. The body is so greatly lengthened, that the siren bears a strong resemblance to an eel: the head is also depressed, the eyes very small, and the ears covered by the external skin: the lower jaw is provided with small teeth, and several rows are in the palate; but the upper jaw has none. It was for a long time supposed that only one species existed, named by Linnæus *Siren lacertina*; but very recently science has become indebted to M. Leconte, a distinguished naturalist of North America, for the discovery and publication of two others; both of which, like the former, inhabit the muddy swamps of South Carolina. They feed upon earthworms, aquatic insects, &c., in search of which they mostly burrow in the mud. It is almost unnecessary to advert to the opinions, formerly entertained, respecting the sirens being imperfect salamanders. M. Cuvier has fully confirmed the supposition of Linnæus, and all the American naturalists; since he has demonstrated that these reptiles could never, from their particular organisation, have hind feet, nor could they lose their gills. The siren, then, is a true *Amphibian*, respiring, like a fish in water, by its gills; or, upon dry land, like a reptile, by its lungs.

(102.) The *Cæcilia*, or blind newt, has been arranged by Cuvier at the end of the serpents, contrary, however, to the opinions of most other naturalists, who consider it as more properly belonging to the am-

phibians. Professor Bell, whose opinion we adopt, places it as the type of a distinct order, which he names *Apoda*.* They derive their name from the excessive smallness of the eyes, which are nearly concealed beneath the skin, while in one species (*C. lumbricoïdes* Daud.) they are altogether wanting. The structure of these reptiles is so peculiar, and so important in reference to our opinion on the station they hold as an extreme aberrant type, that we shall give them nearly in the words of the *Règne Animal*. “The *Cæcilia*,” observes M. Cuvier, “has the skin smooth, viscous, and furrowed with folds or annular wrinkles: it appears naked, but when dissected exhibits in its thickness some scales, slender indeed, but perfectly formed, and regularly disposed in many transverse ranges between the wrinkles of the skin. The head is depressed, the anus round, and situated nearly at the extremity of the body: the ribs are much too short to surround the trunk: the articulations of the bodies of the vertebræ are made by facets, like a hollow cone filled with gelatinous cartilage, as in fishes and salamanders; and their cranium, like that of frogs, is united to the first vertebra by two tubercles. Among the ophidians, the *Amphisbænæ* alone approximate to this structure. The maxillary bones cover the orbit, which is only pierced with a very small hole, and those of the temples cover the temporal foss, so that the head presents above nothing but a continued osseous buckler. Their hyoid bone, composed of three pieces of arches, might lead to the belief that in their early age they had gills. Their maxillary and palate teeth are ranged on two concentric lines, as in the sirens (or true *Amphibia*), but are often sharp and curved backwards, like those of true serpents. Their nostrils open at the back part of the palate, and their lower jaw has no mobile pedicle, since the tympanic bone is en-chased with the other bones in the buckler of the cranium. The auricle of the heart is not divided sufficiently deep to be regarded as double; but their second lung is

* The learned professor will probably change this name, as it is too like that of the Linnæan order of fishes—*Apodes*.

equally small with that of the generality of serpents: the liver is divided into numerous transverse foliations. Vegetable matter, mould, and sand are found in the intestines. Finally, the only osselet of the ear is a small plate over the *fenestra ovalis*, as in the salamanders.”*

(103.) We shall now conclude this rapid survey of the amphibians by some remarks upon the sirens. It has been said that these animals, uniting in themselves so many opposite affinities, “are of the number of those beings which seem peculiarly formed to set classification at defiance, and which are distinguished in the animal kingdom for the anomalies of their organisation.” This sentence, however, betrays but a very partial acquaintance with the subject. In the first place, we deny that there are any anomalies in nature, although there appear to be many when we attempt to work out her natural groups. Anomalies imply contradictions to established laws; let us ask, therefore, upon what grounds we can term the structure of any being anomalous, before we are acquainted with those laws which it contradicts? If we invent systems of supposed affinities, without any regard to those beautiful harmonies of representation which nature almost forces upon our notice, not only the siren but innumerable other animals will appear altogether anomalous. The contradictions, however, which they present must be laid at the right door; that is, to the errors of our own systems, and not to the departure of nature from those laws of which we have but an imperfect knowledge. But let us look to the sirens, or, indeed, to the whole of the amphibious class, in another point of view. All writers agree that they exhibit as many affinities to fish as they do to true reptiles; nay, no less a name than that of Camper can be cited for considering the siren as a true fish, belonging to the apodal order of Linnæus! If then—as nature every where proceeds by “measured steps and slow” in leaving one group and entering upon another—if then, she has given to a group of animals a peculiar organisation inter-

* Cuv. Règne Anim., ii. 98. Griff. Cuv., pl. 26. p. 281.

mediate between reptiles and fish, it becomes absolutely necessary that such animals should exhibit differences from both the classes they are intended to connect; that they should be, in fact, the graduating links—the narrow but well-proportioned passage—which is to lead us from one vestibule of nature's temple to another; and so, accordingly, do we find them. So far, then, is the siren from being peculiarly formed, so to speak, for setting *natural* classification at defiance, that it offers one of the most beautiful and most essential links in the chain of nature. The anomaly would be, if such animals had never been created. Without them there would be a gap, “which nature's self would rue,” as destroying, in the most perfectly-organised kingdom of the animal world, that particular race of beings which demonstrates the union of the whole of the vertebrated animals into one vast circle.

CHAP. VIII.

ON THE CLASS REPTILIA, OR REPTILES.

(104.) THE class of REPTILES, which we now enter upon, comprehends a large but uninviting assemblage of animals, wherein the vertebrated structure, in some groups, is reduced to its minimum. The form, indeed, which nature has now assumed, is associated, in most minds, with deformity or with horror. Yet, however the bulk of mankind may turn with disgust from the contemplation of these creatures, the philosophic observer, who knows that every thing which has proceeded from the hand of Omnipotence is, in its kind, good and perfect, will patiently investigate their history, and will endeavour to illustrate, in these despised and repulsive animals, those sublime truths of UNITY OF PLAN which are as perfect

and apparent in the structure of a loathsome reptile, as in the formation of a paradise-bird.

(105.) The general structure of this class may be thus briefly explained. The body is either covered with scales, as in lizards and serpents, or enclosed in a hard horny covering, as in the tortoises. The feet are always short, but in the serpents these members are entirely wanting. Their blood is red, but cold; hence, as M. Cuvier remarks, they have no occasion for teguments capable of retaining heat. In all cold-blooded animals, not aquatic, the vital principle is much stronger than in those whose blood is warm. The cruel experiments of Redi, and the naturalists of that school, while they establish this fact, are too revolting to be detailed. The tortoise will continue to live and exhibit voluntary motion, after having lost its brain, and even for a considerable time after decapitation: the heart will beat for several hours after it has been taken out, and its loss does not hinder the body from moving, long after its extraction. All reptiles proceed from eggs*, which are deposited by the female, and left to hatch. In general the young emerge from the egg under the form they always retain.

(106.) The relations of this class to the other vertebrated animals, and to the *Mollusca*, is in many respects obscure. No one can doubt that they are one of the most imperfect divisions of the *Vertebrata*; that is to say, having a structure greatly inferior to that seen among quadrupeds or birds. The class is therefore aberrant, and makes the nearest approach of any other to the molluscous animals. It has long ago been remarked that the tortoises, more than any other reptiles, evince the greatest affinity to the *Cephalopoda*, or cuttle-fish; but it is also obvious, that between these two groups there is a wide and strongly-marked distinction. No animal, it is true, yet discovered, militates against these relations; but the numerous fossil remains attest the fact, that the *Cephalopoda* was a class of animals much

* Excepting a few almost solitary instances of viviparous species,

more characteristic of a former world than of this: the existing species, comparatively, are few, and exhibit but little variation in structure. We are therefore justified in supposing that those intermediate gradations of form, between a turtle and a cuttle-fish, are either exterminated, or remain still hid in the unfathomable depths of ocean. The connection of the reptiles to the succeeding class of birds is also interrupted, but by no means indeterminate. It has been stated, indeed, that the tortoises, while they lead on one hand to the *Cephalopoda*, or cuttle-fish, conduct us at the same time to birds, in support of which several ingenious comparisons have been drawn between a turtle and a penguin (*Hor. Ent.* 264.). But it must be remembered that this bird does not, "like a turtle, drag itself on its belly," but walks perfectly erect; and, in the second place, that if the tortoises really make the nearest approach to the *Cephalopoda*, then the transition to birds must be effected by some other group. Now this other group, which, according to the theory of representation, would make the nearest approach to birds, is composed of the *Enalosaures*, or fish-lizards, which have fins similar to the tortoises, and very analogous to the penguins: the mouth also is prolonged into a rostrum, or lengthened bill. This latter character is still more conspicuous in those most extraordinary fossil animals, the *Pterodactyli*, or flying lizards, where we see, for the first time among reptiles, the fore feet converted into wings. To attempt to demonstrate the natural station of these flying reptiles, now only known by their fossil bones, might be thought too speculative; but their whole structure assimilates them more to the *Enalosaures* than to any other division of reptiles: and in comprehending them as aberrant forms of that group, we preserve its chief characteristic of being an extinct order, and do no violence to nature in supposing that she would connect the reptiles to birds by some tribe of the former animals which had the power of flight.

(107.) The relation of reptiles to fish on one side, and to the true *Amphibia* upon the other, is so apparent,

that no difficulty exists in establishing these affinities. All writers agree that the *Enalosaures* make a decided approach to fish. The very name of *Ichthyosaurus*, bestowed upon the best known of these fossil reptiles by the learned Kœnig, might be taken as a strong confirmation of these views. The *Enalosaures*, in fact, are the fish of the reptile class, for they all swim by means, not of feet, but of fins: this at once shows, almost to demonstration, the union of the three aberrant classes of vertebrated animals into one circle. On the intimate union between the reptiles and the *Amphibia*, strictly so termed, we need not dilate: their affinity is so close, that M. Cuvier includes them both under one order; the frogs and the sirens forming his division of batracian reptiles, or part of the *Amphibia* of the present work.

(108.) On the natural or primary groups of this class, no two naturalists have agreed; nor, indeed, is it likely they should, seeing that the only object hitherto aimed at, has been that artificial separation and division necessary to study parts, without any reference to the relation which these parts bear to other classes of animals. To this remark, however, there are two exceptions, which we shall presently notice. As animals may be arranged in a hundred different ways, and as each of these will be a separate mode of classification, it seems unnecessary to swell our pages, even had we the space for so doing, with a dry enumeration of these innumerable systems of division; for such only, in point of fact, can they be called. A few general remarks, therefore, on the progress of our knowledge of these animals, is all that we shall now offer to the general reader.

(109.) Under the name of *Amphibia*, Linnæus comprehended not only the salamanders, to which, in modern days, with the frogs, this name is restricted, but also the true reptiles and a large number of fishes.* Gmelin deserves some credit for detaching these latter from the class, by placing the *Nantes* of the Swedish naturalist

* Syst. Nat. 13 ed. Vind. 1767.

(or the sharks, rays, lampreys, &c.) among the fishes. But a much more important advance to a correct knowledge of the group, was made by Cuvier, not so much in the definition of the greater divisions, as in the valuable details which his anatomical knowledge enabled him to give us in the *Règne Animal*. He there adopts the primary divisions instituted by M. Brongniart, considering the class of reptiles as comprehending four leading groups:—1. The chelonians or tortoises (*Chelonia*), in which the heart has two auricles. The body is supported by four short legs, and enveloped by two plates or shields, formed by the ribs and the sternum.—2. The saurians or lizards (*Sauria*), in which the heart has also two auricles; and the legs are generally four, the body being covered by innumerable small scales.—3. The ophidians or serpents (*Ophidia*), whose construction is similar to the lizards, but the body is always destitute of feet:—and 4. The batracians, or frogs and salamanders (*Batrachia*). In this last division, the heart has but one auricle, and the body is covered by a naked skin. The greater part undergo a metamorphosis, having, when young, the form and the gills of fish, but loosing the first, and breathing by lungs when arrived at maturity. Some, however, never loose their gills, and others have never more than two feet. But it was only in the arrangement of M. de Blainville, one of the greatest anatomists now living, that we find, for the first time, the true *Amphibia* separated from the reptiles. He arranges the batracians, or the frogs and salamanders, in a new class, because their organisation, as he justly remarks, assimilates them to fish. Subsequently, M. Latreille has made another system of these animals, where we also find the batracians excluded. More recently, however, MM. Dumeril and Bibron, in their elaborate *Erpétologie Générale* *, have attempted to revive the old classification, by bringing in the true *Amphibia* as part of

* *Erpétologie Générale*, ou Hist. Nat. complète des Reptiles. Paris, 1834. Of this valuable work, the most perfect in regard to descriptions hitherto published, four thick volumes have already appeared.

the reptiles. But this arrangement has now become altogether obsolete, at least in this country.

(110.) The only attempts we are aware of, to place the supposed leading divisions of the whole class in a natural series, with reference to their circular affinities, are those proposed first by Mr. Macleay, and secondly by Mr. Gray.* Mr. Macleay considers the natural series of the five groups to stand thus: — 1. The chelonians or tortoises; 2. The emydo-saurians or crocodiles; 3. The saurians or lizards; 4. The dipod ophidians, or two-footed serpents; and 5. The apod ophidians, or true serpents. He considers that “the extremities of this column appear to meet in the *Emys longicollis* (*Chelodina longicollis* Gray); and the whole forms a group which may be distinguished from birds by being cold-blooded, and from the *Amphibia* by having two auricles to the heart, by undergoing no metamorphosis, and finally, by a different system of generation.”† In reference to these remarks (for no other intimations of the author’s views are given), it may be observed generally, that the whole of those extraordinary fossil reptiles which the discoveries of geologists have brought to light, and which, most unquestionably, belong to this class of animals, are unaccountably omitted. It may, indeed, be urged that there exists no absolute proof that the *Ichthyosaurus*, for instance, was not a type of the *Amphibia*; but its whole aspect, and the general opinion of all naturalists, concur in associating it with reptiles. Mr. Conybeare, indeed, to whose unwearied zeal and critical acumen we owe so much regarding these exterminated monsters, has most judiciously placed them in a distinct order, named by him *Enaliosauri*. We cannot, therefore, in any circular arrangement of reptiles, pass over a group so remarkably characterised, and so important in its analogical relations to other animals. Mr. Gray has made two different arrangements of the class REPTILIA: the last of these, which he has honoured us so far as to

* Hor. Ent. 263. Ann. of Nat. Hist. vol. i. p. 276. † Hor. Ent. p. 263.

frame upon the model of our theory of representation, is as follows :—

Saurians.	Climbers.	Quadrumanæ Cuv.	Incessores.
Ophidians.	Carnivorous.	Feræ Linn.	Raptores.
Emydosaurians.	Aquatic.	Cete.	Natatores.
Chelonians.	Large-hoofed.	Ungulata.	Rasores (Gallina).
Amphisbenians.	?	Glires.	Grallatores (Grallæ)

As nothing more is said upon the subject, we are entirely at a loss to discover by what means the tortoises pass into the slow worms or amphisbenians, and why the saurians, or lizards, intervene between these and the ophidians. It would have been satisfactory, also, to have stated in what way the *Grallatores*, whose feet are the most lank and slender of all birds, were analogous to the amphisbenians which have none ; or through what intervening groups their analogy could be traced. All these discrepancies, however, seem to have originated in the oversight of breaking up the true series of the birds, for it is the *Grallatores*, and not the *Rasores*, which (as our author is doubtless aware of) naturally follow the *Natatores*. With every wish, therefore, as may well be supposed, of adopting an arrangement proposed upon our own theory, we are obliged to question the correctness of this view of the subject.

(111.) It is hardly necessary to repeat, that in all attempts to trace the natural series of animals, those species which have become, by whatever cause, extinct, must be taken as much into consideration as those which are now alive. This necessity is not only apparent from the nature of the case, when viewed abstractedly, but from the simple fact, that the discovery of every new fossil animal, however strange in its form, has tended to fill up a blank in the series of those which are at present living. This has been repeatedly acknowledged ; and if any absolute proof was wanting that these extinct forms harmonised with, and entered into the grand series of that creation which belongs to this world, such proofs would be found in the circle of the ungulated quadrupeds (*Ungulata*),

where all those gigantic herbivorous monsters of former stages come in, as part and parcel of one of the most natural groups in Zoology, which group, without these, would exhibit nothing but broken or isolated links of what we have shown to be a continuous chain. Equally remarkable are those extinct reptiles which belong to the class of animals now before us; and it is therefore obvious, that if those which have hitherto been discovered should be here omitted, our arrangement would be altogether partial: it might, indeed, be made to appear very plausible on paper, but no philosophic naturalist would attach to it either credit or authority. True it is that in the arrangement which we shall now submit to such inquirers, several intervals or interruptions in the otherwise gradual chain of continuity will be found; but these, comparatively, will be few, while, from the zeal and ability with which the study of Fossil Zoology is now prosecuted, every fresh discovery will diminish the number of these gaps, by bringing to light some intermediate form necessary to connect others which are now in existence. Upon these principles we are now to ascertain the probable course of the natural groups in the class before us.

(112.) The primary orders of the reptiles appear to be these, and they will be characterised in as simple terms as possible. The first is composed of the serpents or OPHIDES, having the body destitute of any feet, and covered with scales. These crawl upon their belly, and, although a few of them are aquatic, the greater portion live upon dry land. Towards the termination of the series, we begin to find the rudiments of feet, as in the slow worms, first internally, then externally, and finally little appendages, as it were, which are cleft at their tips into minute toes. These conduct us, by a most beautiful series of gradations, to the second great division—the SAURES, or lizards, whose body is not only covered with scales like that of the serpents, but is likewise furnished with four distinct feet: they are all terrestrial, and consequently have their toes

formed for walking: the feet of the chamelions, however, are of a very peculiar construction, and show us such a departure from the ordinary structure seen in lizards, that we are prepared to expect a new modification of the reptile form. This is apparent in the *Emydosaures*, or crocodiles, which, although possessing the general form of the last, are distinguished by being entirely aquatic: hence their feet are webbed; while, in lieu of scales, their body is protected by hard shields or bucklers, sometimes called plates. Other characteristics, of a less obvious, but equally important nature, are possessed by these gigantic creatures, all which will be subsequently noticed. Following these, and with scarcely any marked interruption of the series, come the CHELONIDES, or tortoises; slow-paced animals, enclosed, as it were, in a hard box or shell, covered externally with plates, into which they can withdraw themselves in case of need. However widely different as is the structure of a crocodile and a tortoise, we might here pause to admire the exquisite ease and harmony with which Nature can combine some of her most apparently opposite forms. In the crocodiles, the tail is invariably very long, and armed with ridges of plates; while in the majority of the tortoises, it is so remarkably short as often to be hid: nevertheless, in order to unite these two dissimilar groups, we find in the alligator tortoise the tail of a crocodile engrafted, as it were, upon the body of a tortoise. Thus conducted, we pass onward to the marine turtles, which stand at the opposite extremity of this order; and here, again, we meet with a perfectly analogous change to that by which these chelonian reptiles are united to the crocodiles. The feet of the tortoises, although thick and clumsy, are always separated into short toes; but in the turtles, these feet are metamorphosed into fins;—indicative, in fact, of the last order which we shall notice, namely, the ENALOSAURES or fish-lizards. Here we have some of the most extraordinary reptiles in the whole class. They are all fossil, and, with the ex-

ception of a single genus, are all characterised by possessing fins or paddles instead of toed-feet,—a structure altogether unique in this class, except in the marine turtles, by which this order is unquestionably connected to that of the *Chelonides*. These aquatic turtles, in short, are chelonian reptiles, with the feet of an *Ichthyosaurus*. But there is another form in this order, which appears, at first sight, altogether anomalous, and as such has been considered by all our predecessors: this is the *Plesiosaurus* of Conybeare, an extinct reptile, having the body and fins of the *Ichthyosauri*, but the head and neck of a serpent. And thus do the two extremes of the series we have been tracing, meet. We began with the serpents, and have ended with the *Enalosaures*. The *Plesiosaurus* unites the structure of both, and thus leaves us without any further doubt on the grand outlines of the reptile circle.

CHAP. IX.

ON THE THREE ABERRANT ORDERS, OR THE EMYDOSAURES, THE CHELONIDES AND THE ELANOSAURES, OR THE CROCODILES, TORTOISES, AND FISH LIZARDS.

(113.) THE first order of reptiles which meets us, after leaving the amphibians, is that of the EMYDOSAURES, or crocodiles. They are the most bulky and voracious of all those which are now in existence; and although in outward form they have much of the general aspect of lizards, they are yet very dissimilar in many important points. They differ, in the first place, by their tongue, which is thick, fleshy, flat, and attached to the mouth so much, that the ancients believed this member was altogether wanting. Being aquatic animals, the power of swimming is manifested by palmated feet—a structure not to be found among the lizards—and by

the lateral compression of the tail, which thus acts as a large and powerful fin : the tail is no doubt used also as a means of defence, since it is armed with a serrated ridge of strong square scales. The lower jaw is rather longer than the upper, and both are armed with a single row of pointed teeth. The crocodiles are all inhabitants of the rivers and fresh waters of warm countries, and their mode of feeding is very peculiar. They do not swallow their prey upon seizing it, or is it ever eaten while fresh : the victim is first drowned, and then conveyed to some hole at the edge of the water, where it is suffered to putrify before it is devoured. The recent species are more numerous than was formerly imagined, and they are now arranged under the three genera of *Ramphastoma* Wag., *Crocodilus* Cuv., and *Champsia* Wag. The first comprise the Oriental species, having the mouth or muzzle very long and narrow : the second, or true crocodiles, have this part oblong and greatly depressed ; while the third, or American caymans



(fig. 29.), differ from the last chiefly in having the feet only semipalmated. The true crocodiles are found in both hemispheres, but the caymans are pe-

culiar to the New World. All these agree in certain general characters, which have long induced modern naturalists to keep the three types of the crocodiles distinct from the lizard reptiles, and arrange them not far from the chelonians or tortoises. To these latter, indeed, the crocodiles evince a strong affinity in the coverings of their bodies, for both are defended, not by scales like those of the serpents and lizards, but by plates or shields ; with this difference only, that in the one these plates are compactly united at their edges, while in the other they are sufficiently wide apart to admit the free motion of all parts of the body and limbs. The tail of these reptiles is perhaps the most remarkable feature in their structure : it is very long, greatly

compressed, and armed, like the back, with very strong, upright plates, which form sharp ridges or crests in their centre. With this weapon they can inflict terrific wounds upon their enemies, while it enables them to swim with rapidity. By a peculiarity, however, in the vertebra of their neck, these monsters cannot turn about with much facility; hence they are not difficult to be avoided on those rare occasions when, upon quitting their natural element, they pursue a man upon land. The snout of the crocodiles and caymans is very broad, unusually depressed; the eye small, and the mouth enormously large.

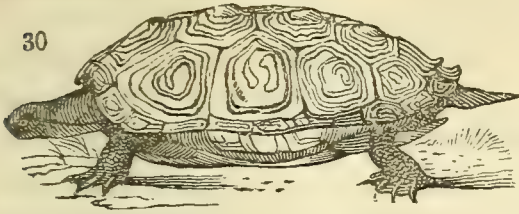
(114.) Crocodiles and caymans have a different geographic range: the first are inhabitants of the Old World, the latter of the New; but both are most abundant in those latitudes which approach nearest to the equinoctial line. The crocodiles of the Nile have furnished much for the admiration of the credulous, and much that is really interesting. It appears that they formed one of the innumerable idols of the ancient Egyptians, and that certain individuals, from being caught when young, could be so tamed as to follow in the train of their religious processions. They are particularly abundant in certain localities, and have been sometimes killed of the length of thirty feet. It is only in the imagination of the painter, that combats between these animals and the elephant, or rhinoceros, have ever existed: the crocodile, in fact, is only dangerous when in the water: upon land it is a slow-paced and even timid animal, so that an active boy, armed with a small hatchet, might easily despatch one: there is no great prowess, therefore, required to ride on the back of a poor cayman, after he has been secured, or perhaps wounded; and a modern writer might well have spared the recital of his feats in this way upon the caymans of Guiana, had he not been influenced in this, and numberless other instances, by the greatest possible love for the marvellous, and a constant propensity to dress truth in the garb of fiction. In Egypt, as well as in the

rivers of Senegal, the crocodiles are less numerous, but more dangerous than those of America ; and yet it is a common thing, of every day occurrence, for the negroes to attack them without fear. As soon as they perceive a crocodile out of the water, they go up boldly to him, and either kill him with spears, or strike into his mouth, when he opens it, an iron harpoon, which at once pins him to the ground. Some, continues the same writer, are even bold enough to attack these animals in their native element, by diving beneath, and stabbing him in the belly ; this, indeed, requires a degree of courage not to be looked for among civilised Europeans. Bosc, the well-known naturalist who travelled in North America, says that he often met numerous troops of crocodiles or caymans when upon some of the rivers, and in the marshy savannahs of that country. He says, without the least pretension or bombast, that he used to amuse himself by making them issue from their retreats, and run towards him, by causing his dog to bark and yelp on the banks. Sometimes he would suffer them to approach near enough to strike them with a stick, but although this did not appear to scare them, they never attempted to attack him ; on the contrary, if they did not perceive any of their usual prey in the vicinity, they would slowly and gravely walk back again into the water. On the Carolina negroes perceiving any of these reptiles upon land, they endeavour to intercept their retreat, and proceed to kill them with their iron tools or hatchets, in order to feast upon the tail. They are, in short, when upon land, decidedly timid animals, and so far from attacking man, they fly from his presence. We often met with them in the same country as Mr. Waterton, but they were so timid, that had we been disposed to perform such ridiculous feats as that traveller narrates, our compassion for the poor animals would have prevented us.

(115.) The tortoises and turtles generally (*CHelonides*) have such a peculiar form, that they must be known to

every one (*fig. 30.*). They may be likened to frogs, so

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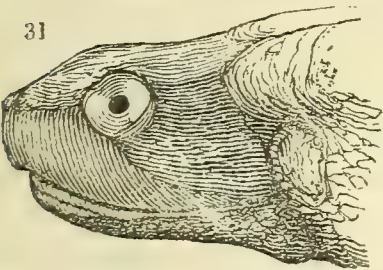


enveloped in horny armour, as to restrain them from jumping. Their gait is proverbially slow, their faculties dull, and they

seem the least intelligent of all vertebrated animals. The head (*fig. 31.*) is not unlike that of a serpent's ; and although not furnished with teeth, the edges of the jaws are so sharp, and their muscular force so strong, that they are capable of separating a finger by their bite. This, in short, is their only means of offence, while they are protected from all enemies but man by the hardness and compactness of the shell, into which they withdraw on the approach of danger. The food of these curious reptiles is as various as their forms and habits. We shall therefore shortly enumerate the principal divisions of the whole tribe, arranging them in the following order :

—1. The *Testudinidæ*, or land tortoises ; 2. The *Emydæ*, or freshwater tortoises ; 3. The *Chelydridæ*, or crocodile tortoises ; 4. The *Trioncidæ*, or soft tortoises ; and 5. The *Chelonidæ*, or sea turtles. This series, founded upon what we

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consider to be the natural or

continuous affinities of each, we shall now enter upon in more detail.*

(116.) The true *Testudinidæ*, or land tortoises, feed only upon roots and vegetables : during the summer they live in woods or among herbage, and pass the winter, in cold climates, beneath the earth, where they burrow and sleep : the feet are short and clubbed, shaped somewhat

* The quinary arrangement of Mr. Gray, contained in his valuable *Synopsis Reptilium*, is somewhat different from this ; the groups are there arranged in the following order : *Testudinidæ*, *Emydæ*, *Chelydæ*, *Trioncidæ* and *Chelonidæ*.

like those of the elephant ; and the toes are furnished with short blunt claws. They are generally dispersed in all the warm and temperate latitudes, but do not extend so far north, in Europe, as our island. Their tails are short and thick, and their shell is of a more or less globular form. Of seventeen described species enumerated by Mr. Gray, thirteen belong to the typical genus ; the others are placed in the genera *Chersina*, *Kinyxis*, and *Pyxis*. 2. The *Emydæ*, or freshwater tortoises, are much more numerous than the last ; and they are eminently distinguished from the land tortoises by living almost entirely in water. Rivers, ponds, and clear running streams, seem to be their favourite haunts. They have been correctly described as most active and rapid in their movements ; for although we frequently saw these animals in the shallow rivulets of the Peloponnesus, we never succeeded in capturing them by the hand : when disturbed, they bury themselves in the mud, and the discolouration of the water thus deceives their enemies. They feed not only upon aquatic worms, insects, and shells, but even upon carrion ; thus differing, by their carnivorous habits, entirely from the land tortoises : to

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assist them in swimming, they are furnished with webbed or palmated feet (*fig. 32.*), the toes are distinct, and the claws not unfrequently are very long.

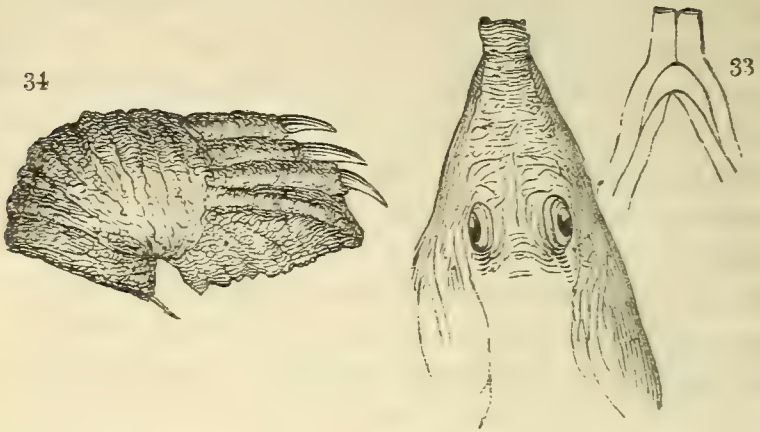
The neck is contractile into the body of the shell, and, as Mr. Gray observes, the caudal pair of plates are separated by a distinct suture : the shell generally is much more depressed than that of the land tortoises. A great number of genera have been recently proposed in this group, chiefly founded upon very trivial modifications in the structure of the shell, which we do not, however, adopt.

(117.) The marine turtles (*Chelonidæ*) are few in number : the feet, as before remarked, now assume the form and office of fins or paddles ; hence they live almost entirely at sea, feeding either upon marine plants, or on mol-

luscous animals. The green turtle (*Chelonia mydas*), so well known to epicures, belongs to this group, and is abundant in the tropical latitudes of the Atlantic Ocean. The logger-head turtle (*Chelonia caretta*), on the contrary, is nearly confined to the Mediterranean ; and although its flesh is stated to be rank and disagreeable, we can assert the contrary from personal experience : it is, in fact, fully equal to that of the green turtle. This group is very limited, there being only seven species of the genus *Chelonia*, and one of *Sphargis*. The shells of the different marine turtles are singularly varied : in some, the scales are imbricated, or laid over each other in the manner of tiles ; in others, they are fixed, with their sides joining each other in the same manner as we see in the land tortoises ; while in the *Sphargis*, or coriaceous turtle, the shell is covered by a thick leather-like skin. This latter structure is very important, because it shows us plainly which group succeeds in the scale of nature. The coriaceous turtle grows to an immense size, and has been captured on the British coast.

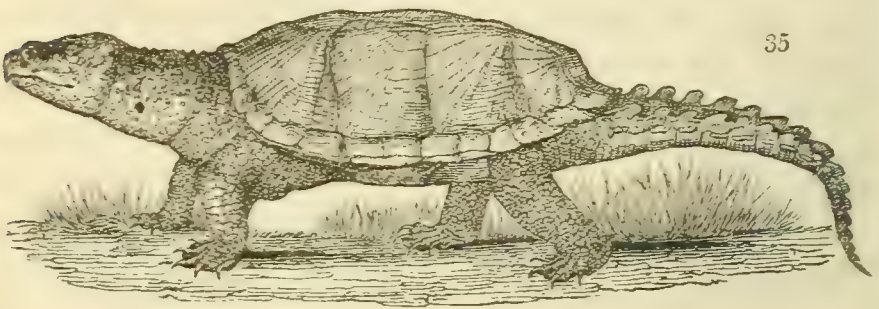
(118.) The next group is formed of the *Trioncidae*, or soft tortoises. They derive this name from the shell being thin and soft ; they have in fact no external plates, both sides of the body being covered with a cartilaginous skin, through which, when dry, the rugged and granulated structure of the ribs is seen. The horn of their beak is clothed externally with fleshy lips ; and their nose, unlike the other tortoises, is prolonged into a small proboscis, having the nostrils at the tip (*fig. 33.*) : the sternal plates, as in the sea tortoises, are partly indented. The feet (*fig. 34.*) are palmate, and usually furnished with five toes, but three only of them have sharp and incurved claws. The tail is very short, and in some almost wanting. As they live entirely in fresh water, they are provided with an additional power of swimming besides that of their palmated feet, for the loose skin of their body forms a thin narrow flap round the edges of the shell, and thus performs the office of a fin. They seem to be entirely carnivorous, or at least the Indian species,

observed by general Hardwicke, are constantly seen eating the bodies of the natives which are floating in



the Ganges.* Those of America appear to have some peculiarities. The fierce tortoise (*Trionyx ferox*), common both to the rivers of Florida, Carolina, and Guiana, lies in ambuscade under the reeds, from whence it darts upon small birds and reptiles, particularly the young alligators. It is vigorous and active, defending itself, when disturbed, with remarkable fierceness, by raising itself upon its legs, darting upon its assailant, and biting with uncommon violence. It grows to a large size, and its flesh is excellent.

(119.) The next and last group of the tortoises has never yet been characterised. We have named it the *Chelidridæ*, in conformity with that which seems to be the type of the whole, namely, the *Chelidra serpentina*, or the alligator tortoise (*fig. 35.*). In these sin-

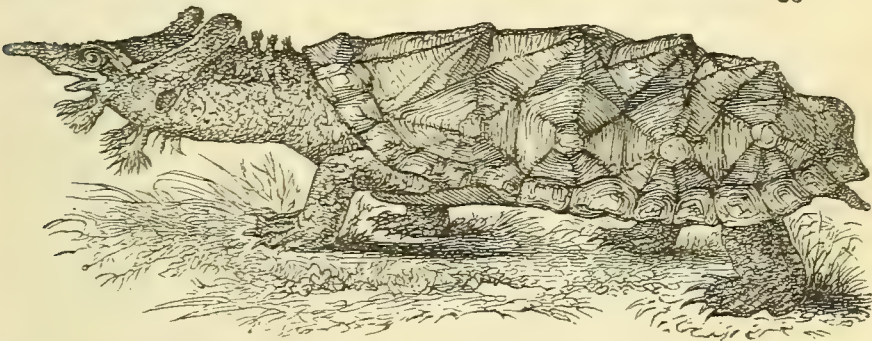


gular animals we have a complete union of the tortoise

* Synop. Reptilium, p. 45.

and the crocodile ; the body and limbs being those of the former, while the tail is long, and sharply serrated, as in the latter. A similar length of tail is found in the genus *Platysternon* of Mr. Gray ; and there is reason to believe that other forms, imperfectly indicated by the old writers, will be ultimately added to this group.* That these singular animals are likewise connected to the soft tortoises, belonging to the last division, is placed beyond doubt by the structure of the *Chelys fimbriata*, or fimbriated tortoise,—an animal which has the lengthened muzzle of the *Trioncidæ*, and the firm and plated shell of the *Chelidridæ*. This singular species (*fig. 36.*) in-

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habits the rivers of South America, and its shell, as in all the other alligator tortoises, is much too small to receive the head and feet : the nose is prolonged into a short thin proboscis, the mouth opens crosswise ; while the jaws, instead of being horny, like its congeners, are covered with a soft skin, “much resembling,” observes Cuvier, “some of the frogs, particularly the *Pipa*, or Surinam toad.” The head and neck are large, thick, and more than half the length of the shell ; the skin in these parts is not only warty, but has several fimbriated or membranaceous appendages, particularly two, which stand nearly erect above the ears, and thus resemble horns : other appendages are on the neck, so that the whole animal has a most singular and grotesque aspect. The tail is like that of the *Trioncidæ*, being but an

* Particularly the *T. squamata* of Linn., which at present rests only upon the short account and rude figure of Bontius, who describes it from personal knowledge. He says that the whole body, as well as the neck, legs, and tail (the latter much lengthened), is covered with scales re-

inch long ; yet the toes, the claws, and the shell, resemble those of the *Chelidridæ*. Such are the prominent distinctions of the families of chelonian reptiles ; to enter into the different generic characters will in this place be unnecessary, since they will be found in the systematic arrangement of the work.

(120.) The analogies resulting from the series in which we have arranged these animals are highly curious, since we thus find representations not only of the primary divisions of the whole class, but of many other groups of animals, whose affinities are yet regulated by the same laws. Some of these we shall now glance at. The *Testudinidæ*, or land tortoises, from the peculiar shape, hardness, beautiful regularity, and highly-finished workmanship of their shells, evince the greatest perfection of that structure which nature has given to this order of reptiles. Like all other typical groups of animals, they are completely terrestrial, and in their slowness of motion, powers of abstinence, and tenacity of life, show the least affinity of all others of their race to the neighbouring groups. We look, therefore, upon this family as the most typical of the chelonians ; and we place them opposite to the *Ophides*, or serpents, these latter being unquestionably typical of the entire class of *Reptilia*. The *Emydæ*, or freshwater tortoises, stand next in the series : these, like the lizards, are remarkably active in their movements, and it is in these two analogous groups, also, that the greatest variations, or, in other words, the greatest number of genera, are to be found. The long-tailed, or alligator-tortoises, forming our *Chelidridæ*, have hitherto been classed with the *Emydæ*, just in the same manner as many authors, even to this day, continue to unite the crocodiles

sembling those of a carp, but stronger and thicker ; yet that the under parts are soft and smooth. Bontius says he had two of these animals, one of which he kept for some time in water ; that it inhabits the rivers of Java, and burrows in its banks to deposit its eggs. The head is small like that of a snake, with small moveable eyes and sharp teeth. I have no doubt but that this refers to some animal still more closely connecting the tortoises to the crocodiles than even the *Chelidra serpentina*.

with the true lizards. The analogy, therefore, of these to the *Emydosaures*, is most striking and beautiful. Following these, we have the *Trioncidæ*, as not only representing tortoises, but more especially the class *Amphibia*, by the naked and soft external covering of their bodies, one of the most striking characteristics of that class. Lastly, come the *Chelonidæ*, or sea-turtles, having the fin-like feet of the *Enalosaures*. No analogies can be stronger than these, and by exhibiting them in a tabular view, we shall bring them all, at one glance, before the eye.

Analogies of the Families of TORTOISES to the Orders of
REPTILES.

Families.		Orders of Reptiles.
<i>Testudinidæ</i> .	{ The most dissimilar and typical of their respective circles; feet imperfect, or none. }	OPHIDES.
<i>Emydæ</i> .	{ Sub-typical in each circle; feet well-formed; active. }	SAURES.
<i>Chelidridæ</i> .	{ Tail long, armed with crested plates; feet palmated. }	EMYDOSAURES.
<i>Trioncidæ</i> .	{ Peculiarly orbicular, and least developed of their respective circles. }	CHELONIDES.
<i>Chelonidæ</i> .	{ Scaly fins or paddles instead of feet; marine. }	ENALOSAURES.

We have said, that if a tortoise was to be likened to any other reptile, in the common acceptation of the word, it resembles nothing so much as a frog or toad encased in the natural armour of its own shield. This remark applies to the whole group generally, but more particularly so to the *Trioncidæ*, or soft tortoises. These, instead of having the outer surface of their bodies covered by hard and naked plates, are enveloped in a soft granular skin, the shell beneath being so slight as to be flexible, and often merely coriaceous or leathery. Secure, therefore, in this analogy, we may compare the two groups on a larger scale.

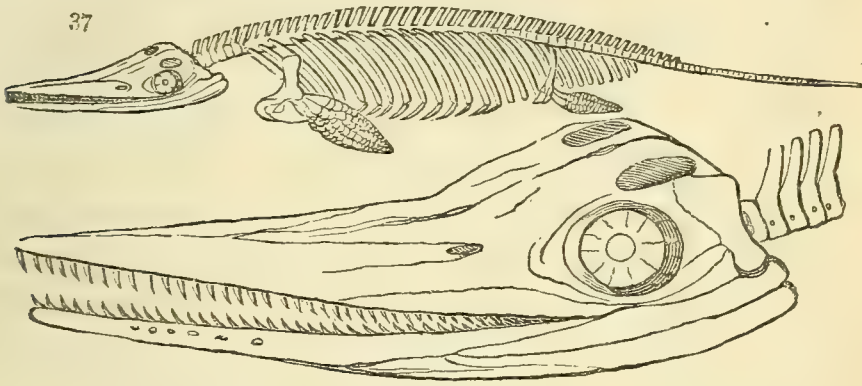
*Analogies of the CHELONIAN REPTILES to the
VERTEBRATED CLASSES.*

Families of Tortoises.	<i>Analogies.</i>	Classes of the Vertebrata.
<i>Testudinidæ.</i>	{ Typical of their respective circles; move slowly.	Quadrupeds.
<i>Emydæ.</i>	Sub-typical; move quickly.	Birds.
<i>Chelidridæ.</i>	{ Tail excessively long, covered with scales.	Reptiles.
<i>Trioncidæ.</i>	Covered with a naked skin.	Amphibians.
<i>Chelonidæ.</i>	Feet transformed into fins.	Fish.

On showing this and the preceding table to an intelligent friend, but who was no naturalist, he observed that such expositions would carry conviction of their truth to every mind, because they exhibited a degree of unity in all branches of the creation hitherto unimagined, and yet on principles so simple, that they could be comprehended by any one, whether naturalist or not, who merely knew the leading points of our theory. To naturalists, indeed, who are unprejudiced, nothing, as we conceive, can be more definite than the circular succession of the tortoises, and the representation they thus give of the primary types of all other animals. Having now taken a rapid view of two out of the three aberrant groups of the class, we shall treat of the third in more detail, on account of its important relation to reptiles, to fishes, and to birds.

(121.) The ENALOSAURES, or fish-lizards, form the third and last aberrant division of the reptiles. Of these wonderful animals, whose fossil remains distinguish the older strata of our globe, no living example has been discovered: they all belonged, apparently, to a former state of the world; yet their determination is of very recent date. Before we investigate the relations which these monsters seem to bear to existing reptiles, we shall notice two of the most striking, which will give the reader a tolerably good idea of the typical characters of the whole; these are the *Ichthyosaurus* and the *Plesiosaurus*.

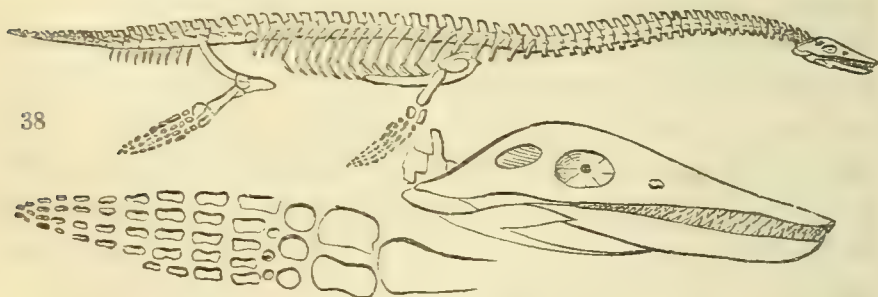
(122.) The general form of the *Ichthyosauri*, or fish-lizards (for there appear to have been many species), is not unlike that of a crocodile, but provided with four fins in lieu of feet (*fig. 37.*). The head is lengthened into a narrow pointed muzzle, the jaws being armed with sharp and formidable teeth; two eyes of enormous size



must have given to its head an aspect altogether extraordinary, and have enabled it to see, with perfect ease, during the night. Although, unquestionably, an aquatic animal, it must have moved more upon the surface of the waters than in the depths, since its structure was such, that it could not breathe, as fishes do, under water. Its short, but strong paddles, or fins, prevented it, likewise, from frequenting the shore, otherwise than in the same manner as the seal or walrus, who scramble awkwardly upon dry land for the mere purpose of repose: when, by violent storms, the *Ichthyosauri* were cast high upon the beach, they must have remained, like whales or porpoises, perfectly unable to regain their native element. They all seem, in fact, to have been entirely marine animals, and in all probability fed upon those immense and innumerable Cephalopodous mollusca, or cuttle-fish, whose shells are so abundant in the rocks wherein the bones of these reptiles are found. The size of these animals varied both in regard to species and to their progressive stages of growth. The skeleton of the slender-beaked species (*I. tenuirostris* Cuv.) usually measures three feet and a half, the head

and tail each occupying a foot; but detached portions of the flat-toothed sort have been found, proving they belonged to individuals which measured from twenty to one and twenty feet long. We have no means of ascertaining the nature of its external skin, whether it was naked as in frogs, or hard, as in crocodiles. The first conjecture, however, seems most probable, as there appears not to have been any external ears, and the skin passed over the tympanic bone, without becoming thinner,—a structure similar to that seen in the cameleon, salamander, and pipa. The remains of *Ichthyosauri* are more frequent in England than in any other country of Europe: they occur in the oolites, or grey sandstone, and the lias, or blue slate of the older beds (denominated by Cuvier the formation of Jura). The quarries of Lyme and Charmouth, in Dorsetshire, have produced the most perfect specimens: but they likewise occur in Warwickshire, and many other parts of the kingdom.

(123.) The *Plesiosaurus*, or serpent-lizard, is even a more wonderful reptile than the last. Without enter-

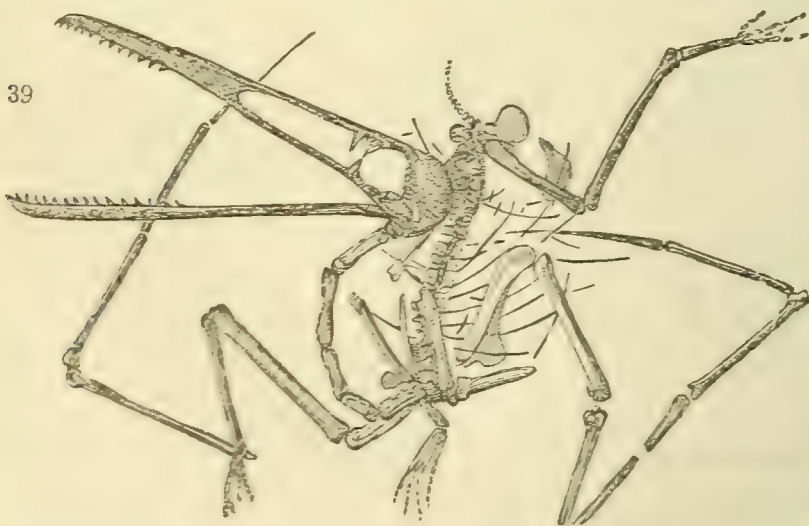


ing into the minute details of its anatomy, the above cut (*fig. 38.*) will be sufficient to give the reader a good idea of its shape. Let him, then, suppose a lizard-shaped animal, full ten feet long, with an enormously long neck, like the body of a serpent, occupying near half the total length, and surmounted by a head disproportionably small to the bulk of the body; four enormous paddles or fins occupy the place of feet, while the tail is short, stout, and pointed. Such is the extraordinary reptile discovered in the year 1824, by an accomplished and

enthusiastic female geologist, Miss Anning, in the blue lias of Lyme Regis, and subsequently described with great ability by Mr. Conybeare. This skeleton is almost entire, and is now, by the munificence of the duke of Buckingham, deposited in the collection of the geological society of London: a still finer specimen has since been found in the same locality, and is placed in the British Museum; both these, however, are of one species, the *Plesiosaurus dolichodeirus*, or long-necked snake-lizard of Conybeare. The habits of this reptile, when alive, have thus been conjectured by M. Cuvier, and the theory of that able anatomist is fully supported by the extraordinary structure of the animal: to these particulars we shall subsequently refer. “ The *Plesiosaurus* in its movements, and in some degree in its figure, must have resembled the chelonian reptiles or sea-turtles: for supposing the turtle to be stripped of its shelly armour, the resemblance would be tolerably exact. There can be no doubt, from the nature of its paddles, that it was an aquatic animal; and that it was marine is equally to be concluded from the débris by which its remains are invariably accompanied. It is probable, that, like the turtle, to whose extremities there is a strong analogy in the *Plesiosaurus*, it may occasionally have visited the coast, where, however, its mode of locomotion must have been exceedingly awkward; neither was it by any means so well fitted for swimming as the *Ichthyosaurus*, as its long neck must have presented a considerable impediment to its progress through the watery element. It is the conjecture of Mr. Conybeare, that, as it breathed the elastic air, and had frequent need of respiration, it generally swam upon, or near the surface of the water, arching back its long neck like the swan, and plunging it downwards at the fishes that passed within its reach: he also thinks it might have lurked in shallow water near the coast, concealing itself among the weeds: thus, raising its nostrils to the surface like the cayman, it might have found a secure shelter from its enemies, and a place of ambush from which to dart

upon its prey. By the suddenness and quickness of its attack, it must have proved a formidable foe to all less powerful animals, and more especially to those of the finny tribe." *

(124.) The *Pterodactyli*, or flying-lizards, another race of antediluvian reptiles, but very distinct from those we have just described, will nevertheless be introduced in this part of our work, for the reasons subsequently stated. The fabulous monsters of antiquity are not more dissimilar in shape from all existing creatures, than are those of which we shall now speak: their forms, indeed, are so strange and unearthly, that they seem more fit to be represented as inmates of a wizard's cave, or to find a place among the chimeras in Teniers's painting of the Temptation of St. Anthony, than as ever having had a real existence upon this our planet. In the *Pterodactyli* we have, in short, the head of a lizard furnished with the ample wings of a bat, together with the long neck and beak of a bird; the latter, however, being armed with distinct teeth (*fig. 39.*). Such is the general impression which a glance at the figure of this wonderful fossil is calculated to give; nor does a more minute



examination lessen our astonishment. The size of the *Pterodactyli*, indeed, had it been at all equal to that of

* Griff. Cuvier, p. 377.

the swimming lizards, would have rendered it perfectly terrific; but they were comparatively small animals. Of two well-ascertained species mentioned by Cuvier, one seems to have been about the size of a thrush, and the other of that of a common bat. Fragments, however, have been found, which are supposed to have belonged to a third and a much larger kind; while, more recently, M. Oken has made known a fourth reptile of this race, which he states to have been covered, not only with hair, but with feathers! The remains of all these flying-lizards are found only in limestone slates of old formation, mixed with those of numberless other reptiles, gigantic tortoises and crocodiles, huge *Megalosauri*, and monstrous swimming lizards of the genera *Ichthyosaurus* and *Plesiosaurus*. The famous limestone quarries of Germany, particularly those near Maestricht and Aichstedt, are the chief deposits of these fossils; and there, no doubt, are yet buried many others of extinct monsters, no longer existing on the surface of the earth.

(125.) The relations of affinity between the swimming lizards and the existing orders of reptiles, deserve much consideration. When it is considered that these animals possessed the exclusive power of swimming, not by a slight modification in the structure of their feet, but by having these members changed, as it were, into absolute fins, we cannot but be struck with their total and essential difference from all other reptiles, so that we need no further proof that they constitute one of the primary divisions of the whole class. The question therefore is, in what part of the natural series do they find a place, so that all their complicated resemblances may be explained, either by their affinity or their analogy to other reptiles. We have already intimated our belief that the *Enalosauri* most probably occupied a station between the tortoises (*Chelones*) and the serpents (*Ophides*), in proof of which we shall now submit the following considerations to the reader.

(126.) If we admit the *Enalosauri* to be a group of

themselves, it follows that this group must be aberrant, and of equal rank with the *Emydosaures*, or crocodiles, and the chelonians, or tortoises. We have already seen that these latter, that is, the crocodiles and the chelonians, are also aberrant, since the first leads to the class *Amphibia*, and the latter to the *Cephalopoda* or cuttlefish. It follows, therefore, that as one of the great divisions of reptiles should lead to fish, the *Enalosauri*, by the above theory, precisely occupy that station in the circle of *Reptilia*, which should blend into that class of animals. Hence we have the body of a reptile with the fins of a fish; hence the peculiarly expressive name of *Ichthyosaurus*, or fish-lizard; and hence the strong impression on the judgment of sir Everard Home for near two years after the first discovery of this fossil, that it belonged to some gigantic fish allied to the sharks. Now all these circumstances tend to show, that not only in general appearance, but in anatomical detail, the structure of these aquatic reptiles much more resembled fish than they did crocodiles. Both sir E. Home and M. Cuvier have proved this affinity by a series of the most minute and valuable comparisons, although the latter is not very precise on the inferences to be drawn from these researches. Sir Everard observed that the shoulder, in the first specimen he examined, exhibited some relation to that of the crocodile; but the position of the nostrils, the circle of osseous pieces surrounding the sclerotic tunic of the eye, and more particularly the structure of the vertebræ, induced that able comparative anatomist to decide on the approximation of the *Ichthyosaurus* to fishes. M. Cuvier, indeed, seems to infer that this wonderful reptile, upon the whole, was more allied to the saurians, yet he is obliged to confess that “as much as the *Ichthyosaurus* resembles the lizards in the form of its osseous head, so much does it differ from them in the conformation of its vertebræ, and in this respect it decidedly approaches the fishes and *Cetaceæ*, as,” continues our author, “sir Everard has well remarked.” The joint opinion, therefore, of two such

eminent observers, on the affinity of the *Enalosauri* to the class *Pisces*, seems to us conclusive on the subject ; more especially as this affinity receives full confirmation from our own theory of the principle of variation in this, and in all other natural groups. Hence it follows that these extinct reptiles united the three aberrant divisions of vertebrated animals into one circle ; namely, the reptiles, the *Amphibia*, and the fish. But the situation which we have assigned to the *Ichthyosaurus*, may be tested in other ways ; thus, for instance, every natural group has one of its aberrant divisions entirely aquatic : fish among vertebrated animals, whales among the *Mammalia*, and the swimming order (*Natatores*) among birds, are some among innumerable proofs that this principle is universal ; each of these groups, in short, symbolically represents the other, and sometimes this is carried so far, that we do not know whether the resemblance is one of analogy or of affinity. As to the supposed connection between the *Ichthyosaurus* and the crocodiles, the two groups correspond to each other in being typical of their respective circles, and they should therefore, from theory, possess some few characters in common ; but we must always recollect that the one, like quadrupeds, are walking animals ; and that the other, like fishes, are provided with fins : they cannot therefore be brought together, or, at least, following one another.

(127.) The preceding remarks will serve also to explain much of what appears anomalous in the structure of the *Plesiosaurus*. The affinity which this extraordinary reptile bears to the marine tortoises, as we have already seen, has been observed both by Cuvier and Conybeare ; while its close relation to *Ichthyosaurus* is perfectly unquestionable. Now if we were called upon to imagine some animal which was to connect the fish-lizards to the ophidians or serpents, we could not devise any form better calculated to fill up the gap than that which nature presents to us in the *Plesiosaurus* : it seems, in fact, compounded of three distinct animals—a turtle, an

Ichthyosaurus, and a snake ; it has the fins of the first, the body of the second, and the serpent-like neck of the last. It is no argument against this theory to urge that there is a wide chasm between our fossil reptile, provided with large paddles, and a true serpent ; for chasms, little inferior to this, occur in every department of nature ; and we must recollect that, in the *Enalosauri*, we are treating of an order of animals whose former existence we only know of by their fossil remains. The remark of M. Conybeare, that the *Plesiosaurus*, from its structure, must have had many of those habits which distinguish the swans, is fully confirmed by comparing the circle of reptiles with the circle of the *Natatores*, or swimming birds, which they in fact represent ; nay, so beautifully and accurately do these groups typify each other, that even the circle of the *Anatidæ*, or ducks, corresponds to that of the reptiles so far as this, that the *Enalosauri* represent the *Anserinæ* ; thus actually bringing the *Plesiosaurus* and the swan into parallel relations of analogy. If an arrangement, in short, is natural, it will stand any test ; and there, in the present instance, are so many, and of such a diversified nature, that by heedfully following this great principle of natural affinity, we shall be guided through difficulties which would otherwise be insurmountable.

(128.) The station in nature of those wonderful reptiles, the flying-lizards, or *Pterodactyli*, may be now considered. Were it not that natural groups are definite, we might be tempted to think that in the class of reptiles, at least, there was one more primary division than in any other department of nature ; and that this, which would make the sixth, would be composed of the *Pterodactyli*. But we cannot for a moment seriously entertain this belief ; opposed, as it is, to that uniform plan upon which we see Nature has invariably proceeded in every instance where her works have been sufficiently studied. Rejecting, therefore, the hypothesis, that the flying-lizards constitute one of the primary divisions of reptiles, our next question is, to which

of the five already enumerated does it seem to bear the greatest affinity? The apparent anomalous structure of these extraordinary animals renders this a most perplexing inquiry. If we look to the shape and character of their enormous head, we fancy a resemblance both to the crocodiles and to the *Ichthyosauri*; but the former are perfectly four-footed animals, walking on the earth as quadrupeds, while the latter are aquatic, and their feet are fin-shaped. Still, however, our choice must be between these two, since it is perfectly clear that the *Pterodactyli* evince a much nearer resemblance to the crocodiles, and the *Ichthyosaurus*, than either to the lizards, tortoises, or the serpents. Now it must be remembered that the crocodiles are connected to the most perfectly-formed of all the orders of reptiles, namely, the *Saures*, the distinguishing character of which is, that, like quadrupeds, they have four feet perfectly developed, and formed for rapid motion. This sort of perfection is not seen among the *Enalosauri*; their organs of locomotion are less perfect, that is, formed upon a less elaborate plan, and only adapted for one particular office — that of swimming in the water. Now the *Pterodactyli* are very much in this situation; they have, indeed, four feet like the lizards, but then they are so peculiarly formed, that two of them, as M. Cuvier observes, could be of little or no use in walking; their feet, therefore, may justly be characterised by the same term, and in the same sense as we designate those of the *Ichthyosaurus*; that is, they are imperfect. If, then, the *Pterodactyli* are admitted to have an affinity either with the recent crocodiles, or with the fossil order of reptiles (*Enalosaures*), it follows that their approximation to the latter is, upon the whole, more than to the former; and that, consequently, they constitute an aberrant group in the order *Enalosaures*, — an order with which they further agree in being exterminated from the existing tribes of reptiles. It may indeed be urged that animals which swim by fins cannot well be placed in a group with others which fly like bats; but let us recollect that

among the tortoises, or chelonian reptiles (one of the best marked groups in nature), we have precisely the same variation. The true tortoises walk only upon dry land, while the marine turtles are entirely aquatic, and have their feet converted into fins. The turtles are aberrant in their own family, so also are the flying lizards in theirs ; nevertheless the difference, after all, between a *Pterodactylus* and an *Ichthyosaurus* is so great that many other forms must have intervened between them.

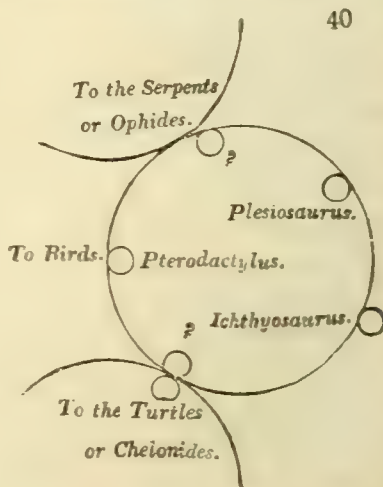
(129.) We have hitherto discussed this question without any reference to analogies, or to that theory of representation which we have so often employed to illustrate a uniformity of plan in the creation. Let us therefore now see how far the foregoing views on the situation of the *Pterodactyli* will bear analogical tests. We have already shown that the group of reptiles in which we have placed the flying lizards, is that which leads to the fish, thereby forming one circular group of the aberrant vertebrated animals. But, as by this disposition of the *Enalosauri*, they will also occupy that part of the reptile circle which comes nearest to birds, we should have been totally at a loss to conceive how this affinity could be established, had it not been for the discovery of these winged reptiles. The dragon lizard, it is true, from being provided with dilated processes in the shape of wings, might be supposed to constitute one link in the chain between reptiles and birds ; but in that animal the resemblance is merely analogical ; for all its four feet are perfectly formed, like the rest of the lizards, and these wing-like processes, although evidently intended to assist the animal as it springs from one branch to another in search of insects, are yet totally incapable of carrying it through the air. No one would think of fixing upon the flying squirrels of America, or the flying fish of the Atlantic, as animals intervening between their own classes and that of birds. The dragon-lizards (*Draco*), of which we are now speaking, are precisely in the same relationship, and they, no doubt, represent

those to which we have compared them. But the structure of the *Pterodactylus* is altogether different. It not only, in its general form, has so much the aspect of a bird, that M. Blumenbach thought that it really belonged to the feathered class; but its anterior extremities, beyond all doubt, were actually a pair of wings. A single glance at the figure of the *Pterodactylus longirostris*, will prove this, were we even inclined to doubt the accurate deductions and the unequivocal opinions expressed by all naturalists. Nor does the similarity here cease; for the hinder feet, like those of birds, were so elongated, that the animal, when walking, must have stood nearly erect. This power, denied to all other known reptiles, is, nevertheless, what we should look for in such animals as would connect lizards to birds. In the present instance, as M. Cuvier has well observed, this erect position would be almost essential to the equilibrium of the body, which was comparatively very small, yet had to sustain a long neck, added to an enormous prolongation of muzzle. Birds alone exhibit similar proportions, and we find the vertebræ of the neck, like that class of animals, are large and prismatic. Finally, we may even establish this affinity by the words of M. Cuvier: — “In the *Pterodactyli*,” observes his translator, “we find an animal which, in its osteology, from the teeth to the end of the claws, presents us with all the essential characters of the lizards. But, at the same time, it was an animal provided with the means of flying, and one which, in a stationary position, would make but little use of its anterior extremities, if, indeed, it did not keep them folded up, as birds do their wings. It could not employ its little fore toes to suspend itself to the branches of trees, but its tranquil position would be ordinarily on its hind feet, like birds. Like them, too, it would keep its neck straightened and curved back, to prevent its enormous head from destroying its equilibrium.”*

* Griff. Cuv. 330.

(130.) In what way the skin of the *Pterodactyli* was covered, is a question of no easy solution, since nothing could be traced in the fossil skeletons of the long-beaked species, calculated to throw light upon this interesting inquiry. It seems, however, as Mr. Kirby obligingly informs us, that a new species of these wonderful reptiles has very recently been discovered by Professor Goldfuss of Bonn, in the Solenhofer slate. From the account which M. Oken has just published of this fossil, it appears that there is sufficient reason to conclude it was not only covered with hairs, but also with feathers! If this supposition is well founded, it confirms, in a most remarkable manner, the position which we have assigned to these animals in the circle of the vertebrata, and incontestably proves that they formed the true link of connection between the class of reptiles and that of birds. We shall now show that this theory receives a confirmation equally strong, by the analogies which result from assigning this station to the *Pterodactyli*.

(131.) It necessarily follows from the foregoing line of reasoning, that if the *Pterodactyli* compose that group which leads more immediately to birds, they are the most aberrant division of the *Enalosaures*; and as every aberrant group has three of these divisions, the two others remain to be discovered. One of these must have intervened between the sea turtles (*Chelonides*), and the fish-lizards (*Ichthyosaures*), while the other must have conducted us to the true serpents (*Ophides*), by some form which blended *Plesiosaurus* with the aquatic serpents. The *Pterodactyli* will thus have on each side an hiatus, as may be better understood by the annexed diagram or circle of the order *Enalosaures*.



(132.) On looking to those birds which, in their own circles, occupy an analogous station to that of *Pterodactylus* among the *Enalosaures*, we cannot fail to perceive several remarkable analogies between them. Let us, therefore, compare the structure of these flying lizards with the tenuirostral and grallatorial types of birds, which, by our present theory, they should represent. Of all the reptiles yet discovered, the *Pterodactyli* have the longest head or muzzle ; and among birds we find this to be the chief character of tenuirostral types, as the name in fact denotes. The humming birds, the hoopoes, and the promerops among perching birds, are all so characterised. Their bills, in proportion, are double the length of all others in their own order. If we turn to the wading birds (*Grallatores*), which represent those just mentioned, the enormous length of their bill is very striking. Not to mention the herons, the woodcocks, and the snipes, where this organ is greatly developed, we see it of still greater length in the curlews and the different groups of the old genus *Ibis*. All these, likewise, have very long necks, so also have the flying lizards, yielding only in this respect to the *Plesiosaurus*. The power of flying and the consequent superiority of motion enjoyed by these reptiles above all their class, are beautifully illustrated by this analogy. The swiftest flying birds are, undoubtedly, among the tenuirostral and the wading types ; for we hesitate not to consider the motion of all the humming birds through the air as more rapid (or at least apparently so) than even that of swallows, while the peculiar length and structure of the wing, in all the typical groups of wading birds, sufficiently shows that this superiority of flight is also one of the principal distinctions of that order. The tail of these lizards, also, was remarkably short, so also is that of all the waders, and in both do we find the tarsus or leg considerably longer than the toes. This analogy, in fine, is as complete as can possibly be expected between two groups belonging to different

classes, so that, however anomalous the structure of the *Pterodactyli* may appear at first sight, we see that in their general structure they in nowise deviate from those primary laws which respectively characterise all natural groups of living animals.

(133.) Having now enlarged more than usual upon the aberrant group of the class *Reptilia*, we shall only add a few words upon the union of the crocodiles, the turtles, and the swimming lizards. This union, notwithstanding the obvious extinction of many of the forms, is placed beyond all doubt, when we refer to the numerous opinions expressed by writers that the *Ichthyosaures* were but marine crocodiles; when we observe the frequent reference made by Cuvier to the analogous points of resemblance between the two; and when we see, even in some of the modern systems, that these two orders are actually united, we can have no doubt of their being really so in nature, although each forms a distinct division of its own. We shall now proceed to a more rapid survey of the two typical orders of reptiles, viz. the Serpents and the Lizards.

CHAP. X.

ON THE OPHIDES, OR SERPENTS.

(134.) THE true serpents form a natural and obvious order, typical in every way of the great class of reptiles; in this assertion we are supported by the authority of M. Cuvier, who observes that the ophidians, “of all reptiles, are those which best merit this name.” The form with which nature has invested those elegant but proverbially insidious creatures, could the mind be divested of their hurtful qualities, would be viewed as highly graceful; clothed, as it is, with innumerable

compact, glossy scales, and frequently ornamented with beautiful and variously coloured patterns. Although deprived of feet, fins, or other obvious members for walking, the serpent glides on the earth, ascends trees, or even directs its course through the waters, with surprising agility and with graceful evolutions ; yet the serpent was cursed “above every beast of the field ;” and man, as if remembering this curse, and the lamentable event which caused it, turns from the reptile with disgust and horror, or seeks to effect its instant destruction.

(135.) In their anatomical and natural characters, the ophidians, or serpents, present us with many peculiarities. They are, generally speaking, destitute of any organs of locomotion projecting from their body, which thus resembles a coach-whip, thickest in the middle, and tapering more towards the tail than to the head. They move upon the ground by an undulating motion, and amongst trees, by encircling the branches. In this they differ entirely from lizards, which are provided with feet, although both agree in having two auricles to the heart, and in the body being covered with numerous scales. These latter characters point out the *OPHIDES*, or serpents, and the *SAURES*, or saurians, as the typical and sub-typical groups of the whole class. In addition to the three kinds of teeth possessed both by lizards and serpents, the latter have others in the palate, disposed in several arched rows : they are fixed or united to the bones, and are not hollowed. The venomous serpents, however, have others very sharp and long, attached to the maxillary bones ; and these, being hollowed like a funnel, convey the poison into the wound they make. Serpents, like lizards and tortoises, are oviparous ; the eggs are covered by a calcareous shell, and the young burst forth to life in the form they are permanently to retain. There are some, however, particularly among the venomous groups, which are viviparous,—that is, the eggs are retained or hatched in the body of the female from whence the

young come forth alive : the duties of the parent are thus superseded, and the offspring are left to seek their own nourishment. The food of these reptiles is wholly animal : the larger prey upon quadrupeds and birds proportionate to their size ; while the smaller devour animals of their own class, together with insects and worms ; but the nature of their teeth, admirable indeed for securing their prey, are useless for the purpose of mastication : their food is therefore gorged in an entire state, and is frequently so bulky, that nearly one half protrudes, as it is said, from the mouth, while the other portion is undergoing digestion. Nearly all serpents are terrestrial, yet many resort chiefly to trees. others to marshes, and some few are entirely aquatic. In these latter, the tail is sufficiently flattened and dilated to serve the office of a fin, by which they pass through the water with great swiftness. This swimming power, however, in some degree, is shared by nearly all of the terrestrial serpents, for even the common snake of this country has been frequently seen out at sea. In their geographic distribution there is nothing remarkable, save that, as heat is more congenial to serpents than cold, we find them most numerous, formidable, and bulky in the tropics. Such as inhabit temperate or colder countries, retire to holes and recesses during winter, where they remain without food, and in a state of torpor, until the return of spring brings them, and the insect tribes upon which they feed, to active life.

(136.) The arrangements proposed for this order are as numerous as the authors who have written upon it : yet as no advantage, but the contrary, would result from giving a dry detail of artificial systems, we must mention with honour the names of Laurenti, Lacepede, and Daudin, as men who have contributed valuable works which have considerably extended the knowledge of this department of nature. More recently, the works of Merrem, Oppel, Cuvier, Wiedman, Wagler, Fitzinger, Spix, Dumeril, Bibron, &c., among continental herpetologists, of Bell and Gray in our own

country, and of Harlan in America, have contributed a vast mass of information on these animals ; while to Cuvier, Conybeare, and Home, we are almost exclusively indebted for the investigation of those immense reptiles which belonged only to a former world. M. Cuvier, more especially, has carried his profound researches among the living serpents, and, by judiciously combining the labours of others with considerable additions of his own, has given us in the *Règne Animal* the grand outlines of all that has been since accomplished.

(137.) The arrangement of Cuvier is that only of which we shall give a short abstract. He commences with the slow-worms (*Anguis*), as obviously leading from lizards to serpents, and which he arranges under four sub-genera, the more typical of these animals being considered as the common *Anguis fragilis* of Europe. The next family after the *Anguidæ*, are the *Amphisbænæ*. these are supposed to lead to the great tribe of true serpents, properly so called, and which are divided into two principal groups, one venomous, and the other not. These correspond to our *Coluberidæ* and *Ophidæ*, and comprise a vast number of smaller groups, sub-genera, and sections, which it is needless here to enumerate. After the venomous group, Cuvier places another composed of the aquatic serpents (arranged by us under the *Hydrophidæ*), and of the extraordinary genus *Cæcilia* : our author making use of this latter form to pass into the batracians or frogs ; but in the opinion of Mr. Bell, these singular animals belong more properly to the *Amphibia*. The innumerable genera and sub-genera of the German herpetologists, M. Cuvier considers, and we think with great justice, as mostly too trivial to be adopted. They have, in fact, been “established” without any other intention than to distinguish small groups *per se*, and they therefore require further investigation before they can be admitted ; more especially as they have been so multiplied of late, as to render it almost impossible to comprehend their

limits or their types. The custom, also, of giving new names to groups long before unobjectionably named, has been carried to such an extent in Germany, that not only all the laws of nomenclature have been violated, but so much confusion has thus been introduced, that every one of these writers seems to consider it necessary to invent a name, and make a genus, for the animal he is about to describe. With these obstacles before us, we shall confine our inquiries to what appear to be the natural affinities of the larger groups alone: we shall, in fact, in this instance, pursue the synthetic method, reserving the result of those researches now in progress, for another opportunity.

(138.) The primary groups, into which we shall now distribute the *Ophides*, or serpents, may be thus briefly stated. We have already shown that this order stands between the *Enalosaures*, or swimming lizards, and the true lizards (*Saures*). Between the terrestrial snakes and the aquatic *Enalosaures*, there is, however, a group of serpents which departs most materially from the rest of the order by being aquatic, not merely so by occasionally frequenting water, but by living entirely in that element, and by possessing a structure suited to such habits. These water serpents constitute, in our opinion, the nearest approach to the aquatic or swimming lizards, and we consequently place the *Hydrophidæ* as the first great group from which we commence our route. Now, these water serpents are placed by M. Cuvier immediately after those which are also decidedly venomous, but live upon land, and possess a peculiar organisation. We pass therefore, by means, probably, of the *Platuri*, from the *Hydrophidæ* to the *Crotalidæ*,—the most deadly and terrific of all serpents, and which are consequently the most typical. Here we find the different species of *Crotalus*, or rattle-snake, the horned vipers of Africa and India, and all those venomous groups to which M. Cuvier has assigned particular characters. The transition from these to the *Coluberidæ* is marked by so many gentle gradations, that Linnæus very often

mistook the one family for the other, and M. Cuvier makes them two large divisions of one great group. Although the *Crotalidæ* are most typical from their venomous powers, yet their number are vastly inferior to the *Coluberidæ*, or true snakes, where the species appear almost innumerable, and where, in consequence, we have more variations of form than in any other similar group. We quit these, in all probability, by the genus *Tortrix* of Oppel, and enter among the slow-worms, aptly named *Ophidosauri*, but which consistency in nomenclature obliges us to term *Anguidæ*: here we at once perceive that nature is about to assume a new garb. We have serpents possessing the first rudiments of feet by concealed clavicles beneath their skin, and others which exhibit, on dissection, an imperfect pelvis, a small sternum, and a clavicle: they are, in fact, as M. Cuvier happily expresses it, “seps, or lizards without feet.” It is therefore from this point of the ophidian circle that nature branches off to the true lizards, and this by a route so obvious and beautiful, that its direction has never been questioned. The *Amphisbænæ* present us with a singular departure from other serpents, in having the eyes so slightly developed that one species (*A. cæca*) is entirely blind. Now, the only *Amphibia* which show a similar tendency to blindness, are the *Cæcilidæ*, which are placed by Mr. Bell, in his circular arrangement of the *Amphibia*, precisely in that station which corresponds to the *Amphisbænidæ*. These, therefore, being connected to the *Anguidæ* on one side, and to the *Hydrophidæ* upon the other, complete the series; and the circle of the ophidian reptiles is thus closed.

(139.) The analogies of these groups to those of the *Vertebrata* may be slightly glanced at. It is obvious that the *Crotalidæ*, being the most typical, represent the quadrupeds among vertebrated animals, the order *Feræ* among *Mammalia*, and that of *Raptores* among birds: the aquatic orders of *Cetæ*, *Natatores*, and the class of fish, find their analogy in the *Hydrophidæ*, or

water serpents ; while *Amphisbæna* is a beautiful representation, in many remarkable particulars, of *Cæcilia* in the class *Amphibia*, and consequently of all those types which correspond to that division of the *Vertebrata*.

(140.) We shall now take a rapid glance at the general contents of these families, considering the *Hydrophidæ*, the *Anguidæ*, and the *Amphisbænidæ*, as constituting the aberrant group ; the *Crotalidæ*, or poisonous snakes, as the typical ; and the *Coluberidæ*, or common snakes, as the sub-typical.

(141.) The HYDROPHIDÆ, or sea serpents, are comparatively few : they seem to be limited in their geographic range to certain latitudes of the Indian seas, where, however, they are not uncommon. They are chiefly known by the vertical compression of the hinder part of the body and tail : the latter is sometimes so broad, that it may be compared to an oar ; hence these animals swim with the greatest ease : the jaws are differently armed both from those of the *Coluberidæ* and the *Ophidæ* ; the teeth, indeed, in many respects resemble the former, but the anterior maxillaries are longer, and formed precisely the same as the poisonous isolated fangs of the *Ophidæ*. M. Cuvier admits two genera—*Pseudoboa* and *Hydrus* : the latter contains the sub-genera *Hydrophis*, *Pelamides*, and *Chersydrus*. It is curious, as showing the tendency of the three aberrant divisions of serpents to unite into one circle, that Linnæus considered the *Pelamides* as a true slow-worm, and accordingly named it *Anguis platyrus*.

(142.) The AMPHISBÆNIDÆ are a small group of singular-shaped serpents so like the slow-worms in general appearance, that we have more than once questioned, in our own minds, the propriety of separating them so very distinctly by arranging them in different families. Cuvier, however, has done this ; and, under existing circumstances, we shall, for the present, follow his example. In outward appearance they show us a long cylindrical body of equal girth throughout, and with the two rounded extremities so much alike, that it is

difficult, on a cursory glance, to distinguish the head from the tail; hence they have been called *double-walkers* by the French, and double-headed snakes by some English writers: the eyes, like most of the slow-worms, are so very small as sometimes to appear wanting; the vent is within an inch of the tail, and exhibits a row of pores; while the whole body, excepting the head, which is plaited, is encircled, in the typical species, with circular rows of quadrangular scales; the teeth are small, conical, and placed in the jaws; while the second lobe of the lungs, which in many of the true slow-worms is reduced to a rudiment, becomes, in these reptiles, altogether obsolete. The *Amphisbænidæ* are few in number, completely terrestrial, and are mostly found in the warm latitudes of South America.

(143.) The family of the ANGUINIDÆ, or slow-worms, completes the aberrant division of the serpents, and corresponds to the *Ophidosauri*, or lizard-serpents, of some writers. Like all osculant groups employed by nature to connect two very distinct tribes of animals, and where, in consequence, there are very numerous modifications of form, it is exceedingly difficult to characterise the ANGUINIDÆ by determinate characters: they may, however, be considered in external appearance as very much resembling a *Julis* or *Millipede*, so common in decayed wood. The body is cylindrical, and perfectly resembles that of the *Amphisbænidæ*; but, instead of having quadrangular plates, they are covered by imbricated scales, under which, upon dissection, are discovered the bones of the shoulder and pelvis; in the sub-genus *Pseudopus* this affinity to the seps-lizards is carried so far, that on each side of the vent there is a small protuberance, furnished with a little bone analogous to the femur, and belonging to a true pelvis concealed under the skin. The well-known slow or blind-worm of Europe is probably the type of this family; and if we look for the disappearance of all these vestiges of the lizard structure, we find them in the slow-worms of America. The truth, however, is, that the doctrine of types depends

almost entirely upon that knowledge which is gained by analysis ; and in regard to the present group, it is impossible to determine whether a part of the dipod ophidians do not really enter into this circle, or whether they belong to the *Saures*. We therefore proceed to the two typical families.

(144.) The COLUBERIDÆ, or true snakes, are considered by M. Cuvier as following the slow-worms — a disposition which in every respect is natural, because it is demonstrable by analogy. The point of junction, however, has not clearly been ascertained. M. Cuvier, speaking of the genus *Typhlops*, observes that they are small snakes, which, on a careless glance, resemble slow-worms. On entering upon this family, however, we find most of the characteristic properties of the ophidian reptiles highly developed : one of these is the power of dilating the throat to such an astonishing degree, as to admit the swallowing of animals much thicker than the serpent itself. The following anatomical facts will explain this. The tympanic bone, or pedicle of the lower-jaw, is mobile, and almost always suspended to another bone, analogous to the mastoidian, attached on the cranium by muscles and ligaments which permit its moving : the branches, likewise, of this jaw are united to each other, and those of the upper jaw to the intermaxillary only by ligaments, so that they can, in a greater or less degree, be separated. The palatine arches are also moveable, and are armed with sharp teeth curved backwards ; but these teeth are fixed, and are not perforated like those of the next family : the branches of the upper and under jaws are furnished for their entire length with these teeth : there are consequently four ranges in the upper part of the mouth, and two in the under. Such appear to be the leading anatomical peculiarities of this family, the most numerous in species, and in the variations of their forms, of any in the whole tribe. The sub-divisions, consequently, are very many ; but as these have been made with the sole object of distinguishing structure, without any reference to the affinities and

analogies of the natural series, their bare enumeration in this part of our work would be devoid of all popular interest. It will be enough, therefore, if we glance only over the series, as given in the *Règne Animal*, and touch upon the most remarkable genera. The genera *Tortrix* and *Uropeltis* still retain many of the characters of the slow-worms, or *Anguinidæ*: but among the gigantic boas of the New World, the mastoidian bones being detached, the jaws are capable of an enormous dilatation. Few of our readers but must have heard of the *Boa constrictor*, as being one of the most gigantic serpents in existence, and whose history would be termed incredible but for the united testimony of all travellers who have seen its maturity of growth in its native regions. Young individuals are frequently in our menageries, but they are mere pygmies in comparison to the adults, which have been often found to exceed forty feet in length. Of this group, which includes several minor divisions, all the species appear to be restricted to the tropics of America, where they represent the pithons of the Old World, a race of equal magnitude to the boas. Then follows a host of genera and sub-genera, differing chiefly in the size, number, and pattern of their scales. These insensibly lead us to the European snakes, of which the *Coluber natrix* is the best known example: it may be handled without fear, for it never bites but in self-defence, and even then not at all dangerously. The largest serpent found in Europe is the four-striped (*Coluber Elaphis*), which sometimes exceeds six feet in length; while that represented by the ancients as the companion of Esculapius (*C. Esculapii*), is still found in Italy and the southern provinces adjacent. The foreign snakes of this family, as remarked by Cuvier, are innumerable, some remarkable for the vivacity of their colours, others for the regularity of their markings, yet few attain to a large size, besides those we have already noticed. Finally, we may terminate this division with the very singular genus *Achrochordus*, a serpent of large dimensions, and peculiar to the island of Java; it is entirely

covered in all its parts with small uniform scales, each of which is slightly raised and marked with three ridges.

(145.) The family of CROTALIDÆ, as containing the most terrible serpents of the whole tribe, is pre-eminently typical of the ophidian or serpent reptiles. These terrific beings, from which, but with a solitary exception, the kingdoms of Europe are happily free, infest the warmer regions of America, Asia, and Africa ; and by and from their venomous fangs can inflict almost instant death. They possess, as M. Cuvier well observes, a “very peculiar structure” in their organs of manducation, abundantly sufficient, indeed, to justify us, did no other reasons exist, in viewing them as a primary division of the whole tribe.

(146.) The truly venomous serpents have isolated fangs, from which the poison is distilled. “Their upper maxillary bones are very small, and supported on a long pedicle, analogous to the external pterygoid apophysis of the sphenoid, and are very mobile. There is fixed in them a sharp tooth, pierced by a small canal, which gives issue to a liquor secreted by a considerable gland situated under the eye. It is this fluid, flowing into the wound made by the tooth, which carries destruction into the body of animals, and produces effects more or less fatal, according to the species of the serpent from which it comes. This tooth is concealed in a fold of the gum, when the serpent does not choose to make use of it ; and there are behind it several germs destined to replace it, if it should be broken in a wound. Naturalists have named these venomous teeth moveable fangs, but, properly speaking, it is the maxillary bone which moves : it bears no other teeth whatsoever, so that in these serpents it is only the two ranges of palatine teeth which are visible in the roof of the mouth.”* In other respects this family, at least in its external characters, does not differ very remarkably from the last. Their

* Cuv.

head, however, is large behind, and possesses an aspect of ferocity, well suited to their natural character: the jaws are very dilatable, and the tongue remarkably extensible. Such of the species whose mode of reproduction is best known, bring forth their young alive; hence their common name *Vipers*, which, as M. Cuvier remarks, seems to be a contraction of *viviparous*. In the majority of venomous serpents, the *viæ lachrymales* exhibit a remarkable modification, inasmuch as the lachrymal canals immediately pour the tears into the nasal fosses, without depositing them in the intermaxillary reservoir. Another peculiarity belonging to this group must also be mentioned; it consists of a deep hole, or perforation, behind each nostril, the use of which has not yet been discovered.

(147.) A general sketch of the different groups composing this family, is all that will interest the general reader; since their true affinities remain for future investigation, and their scientific details will be given in another place. We enter among the poisonous serpents, either by the *Achrochordus Javensis*, already noticed, the genus *Sepidon* of Merrem, or perhaps by that of *Naia*, formed of the *Cobra de Capellos*, or hooded serpents, of the East Indies. M. Cuvier places the first of these serpents at the termination of the family *Columberidæ*, and just before the present division. Its precise situation depends upon analysis; but there can be little doubt, judging from its general appearance, that it represents the *Amphisbæenæ*, and consequently the *Anguidæ* or slow-worms. The *Cobra de Capello* (a Portuguese name signifying the snake with a hat or hood) bears the rasorial designation of two eye-like spots, in the shape of a pair of spectacles, marked on its back, from whence it is termed, amongst us, the spectacle-snake. It is one of the most deadly serpents of the East, and when irritated has the power of raising the anterior ribs, and drawing them forward, so as to dilate this part of the body into the appearance of a hood or cowl, on each side of the head. There seem to be several species,

forming the modern genus *Naia**: most of these are tamed by the Indian jugglers, who extract their poisonous fangs, and then teach them to dance to the sound of music. Another species inhabits Africa, where it was formerly looked upon by the ancient Egyptians as an emblem of the divinity, and worshipped accordingly. Close to these M. Cuvier places the true vipers, called by the barbarous name of *Vipera* by Daudin, but to which we now restore the classic appellation. The plates of the head, which in the genus *Naia* are very similar to those of the adder's, are imbricated (like those of the back) among the true vipers. Nevertheless, so closely do these poisonous reptiles resemble the *Coluberidæ*, or non-venomous serpents, in their general aspect, that Linnæus confounded them together. The vipers, however, have poisonous fangs, which the snakes have not; yet in both the plates of the under part of the tail are double; while they are easily distinguished from the *Crotalidæ*, or rattlesnakes, by not having the hollow excavations behind the nostrils already alluded to. The genus *Sepedon*, observes M. Cuvier, is only separated from that of *Ophis* Sw., or the true vipers, by the head being covered with plates, similar to the snakes (*Coluberidæ*). The common viper of Europe (*Col. Berus* Lin.) is well known, but, from being subject to considerable variation in colour, has been multiplied into many species: sometimes it is found entirely black. Immediately after these genuine vipers, we place the horned species of India and Africa, among which is the famous *Cerastes*, remarkable for its fatal venom, and for the two little horns, or rather pointed bones, placed immediately over each eye: they give to the animal, which is entirely of a livid grey, a most terrific appearance: another species, the plumed viper, is found in Africa; but this, instead of horns, has the eyes surmounted by tufts of short thread-like filaments. Next in order come the most formidable and

* A new and beautiful species allied to this has been discovered and described by Dr. Carter, in the Asiatic Researches, xx. 88. pl. 10., under the sub-generic name of *Hamadryas ophiophagus*.

deadly of all serpents, namely, the *Crotalidæ* or rattle-snakes, a small but very remarkable group, celebrated for the subtlety of their poison. The rattle-snakes of America are probably typical of this division, and are the only ones, in fact, which possess the instrument so called, and to which the name can be properly applied. As these reptiles are frequently brought to this country alive, they need not be particularly described. We shall merely remark, in this place, that these and such others as belong to this sub-family, are well distinguished from the preceding by having a round hollow hole, or perforation, behind each nostril: the rattles increase with age, and an additional one is gained each time the reptile casts its skin. All the species are natives of America. They move slowly, and seldom bite unless provoked, or when seizing their prey: the scales on the head are similar to those of the body, but in the sub-genus *Crotolophorus* these plates are large. The *Trigonocephali*, or angular-headed serpents, are equally venomous with the rattle-snakes, but are destitute of any caudal apparatus for occasioning noise. Some of these, as the genus *Tisiphone*, have the tail terminated by a sting, and the genus *Craspidocephalus* is known by the subcaudal scales being double, and those of the head and back being similar: other peculiarities belong to some of the species, but they are of minor importance. We pass, therefore, to the *Platurinæ*, or flat-tailed water serpents, placed by M. Cuvier in this family, on account of their teeth; by which, as he justly concludes, they are rendered essentially different from the *Hydrophidæ*, or true aquatic serpents already mentioned: in these the head is enveloped with plates, and those of the tail are double, this part being compressed in the form of an oar: hence it is probable that this is the point of union between the *Hydrophidæ* and the *Crotalidæ*. After these are placed certain genera (whose true affinities, however, are very ambiguous), which agree with the vipers, except that their subcaudal plates are more or less simple; these genera are *Trimesurus*, *Ophicephalus*, and *Acan-*

thophis, the tail of the latter being armed, like that of *Tisiphone*, with a sting. Finally, we may separate, as a distinct division of this family, the *Elapsinæ*, eminently distinguished by having no power of dilating their jaws, which can hardly separate behind, in consequence of the shortness both of their tympanic and their mastoidian bones : hence it results, that the head, like that of *Tortrix* and *Amphisbæna*, is altogether of a piece with the body. The most common species (*E. lemniscatus*) is elegantly marked with black rings, three by three, upon a white ground. All these serpents appear to be harmless.

(148.) We have thus, from the indications given in the *Règne Animal*, endeavoured to throw the leading groups of the *Crotalidæ* or venomous family, into something like a circular series ; but as the whole require a detailed investigation, we merely look upon this disposition of the groups, as the first rude process of arriving hereafter at a better knowledge of their affinities. Certain, however, it is, that there are no want of types connecting the *Crotalidæ* to the *Coluberidæ*, while the *Platuri* of Latreille, placed by M. Cuvier immediately before the *Hydrophidæ* Sw., renders the connection between this latter family and the *Crotalidæ* indisputable. Between the *Hydrophidæ*, or aquatic serpents, we have, for the present, arranged the *Amphisbænæ*, already described, and this closes our survey of the *Ophides*, or serpents.

CHAP. XI.

ON THE SAURES OR LIZARDS.

(149.) Under the order of SAURES, the saurian reptiles, or lizards, we comprehend all those furnished with

feet ; having an active, lengthened body, terminating in a tail, and covered with small scales, but not with shields or plates, as in the crocodiles and tortoises : such reptiles are known in common language as lizards and chameleons : and they constitute the second, or subtypical order of the class of reptiles.

(150.) The general characters most prevalent in this assemblage of animals may be thus briefly stated. In their external form they may be compared to thick-bodied serpents, furnished with feet: the mouth is always armed with teeth, and the skin is protected by small scales, more or less crowded: they are all provided with a tail, which is generally very long, thick at the base, and pointed at the end. In such as pass into the serpents, the feet are very small, and are sometimes confined to one pair. They are well distinguished, also, by many anatomical peculiarities: the heart is composed, like that of tortoises (*CHELONIDES*), of two auricles, and of a ventricle, sometimes divided by imperfect partitions: the ribs are moveable, attached to the sternum, and capable of being raised or depressed for respiration. Their generation is almost universally oviparous: the eggs are more or less hard, and the young are born with the form of their parents. The whole of these reptiles are carnivorous, living upon other animals of inferior size and strength to themselves, in a living state, such as small birds, worms, and insects: their digestion is very slow: they eat but seldom, and never drink. In their motions, the majority are possessed of peculiar agility upon land, for none of them, like the crocodiles, inhabit the water. They ascend perpendicular walls and trees with nearly as much swiftness as if they were running upon a level surface; others, as the chameleons, although not active, have their feet adapted solely for grasping and climbing; while the geckos, or nocturnal lizards, as we have often witnessed in Sicily, run over the ceiling with their backs downwards, as quickly as if they were upon the ground.

(151.) The arrangements proposed for the great assemblage now before us, are almost as numerous as the authors who have written upon them; nor would it be difficult to make just as many more “by different hands,” provided these Reptiles are to be viewed as an isolated group, having no relations or resemblances to the other portions of the animal kingdom. To occupy our few remaining pages, therefore, with columns of technical names, would neither interest the scientific naturalist or the general reader; the former will find all these enumerated or abridged in the admirable descriptive volumes of MM. Desmarest and Bibron; and the latter, we are persuaded, would rather be interested by a sketch, however imperfect, of the natural arrangement of the groups, according to our usual principle of showing their relation to other animals. M. Cuvier has designated the primary divisions, and has omitted most of those sub-genera to which we have objected. It has been customary, and even still is, to divide the whole of the lizards into two great groups,—the one with short and thick tongues; the other, where this member is long and slender. This is precisely analogous to the old divisions of ornithology into land and water birds: both are true, abstractedly, but such characters in either case are not enough; neither are they natural, because there are groups, as among the skinks, which are neither one or the other; and because they bring together, under one head, animals of the most opposite structure and appearance. Nevertheless, we find that the formation of the tongue, when combined with other characters, leads to important results. Bearing this in mind, we shall now divide the whole order into the following primary groups or families:—1. The CHAMELEONIDÆ, or chameleons, whose tongue is of immense length, but obtuse, and whose feet and tail are both scansorial. 2. The IGUANIDÆ, or Iguanian lizards, having short thick tongues and palatine teeth, the tail long, and the scales upon the belly not imbricated. 3. The LACERTINIDÆ, or typical lizards with small head, thick neck,

and very long forked tongues. 4. The SCINCOIDÆ, or serpent lizards, with short feet : and, 5. The AGAMIDÆ, or frog lizards, where the head and body (in the typical examples) are depressed, the latter very wide, and the belly and tail covered with imbricate scales ; they have no palatine teeth, and bear a strong resemblance, in many instances, to frogs. The four first of these, with slight modifications, constitute primary groups in the arrangement of the *Règne Animal* ; but the fifth, which is there mentioned only as a genus, we have exalted to the rank of a family, for reasons which will subsequently appear. A slight notice upon each of these is all that our remaining space will admit of.

(152.) The CHAMELEONIDÆ, or chameleons, are distinguished at first sight from all others by having scan-sorial feet, similar in their general structure to those of parrots. There are, indeed, five toes to each foot, as in the generality of lizards ; but these are divided into two parcels, one of two, the other of three toes, and each parcel is united together as far as the claws. The tongue also affords another remarkable character : it is fleshy, and capable of an enormous elongation ; the extremity is thickened or club-shaped, and is furnished with a viscous secretion, by which the small insects at which the tongue is thrown are glued, as it were, to the end, and instantaneously conveyed to the mouth. The chameleons, indeed, are some of the most extraordinary animals in creation ; they seem scarcely to possess the power of motion, for they walk with the greatest circumspection, and will frequently remain hours almost immoveable. Their eyes are unlike those of any other lizard : they are large and prominent, but so much covered by the scaly skin of the orbits, that there only appears a small hole in the middle, opposite to the pupil ; they may thus be compared to a tea-cup inverted, the bowl of which represents the part covered, and the rim round the stand, that through which the animal sees : but this is not all, for it is no uncommon thing to see the animal directing its eyes in two different ways at once,

one eye sometimes looking forward, the other backwards, sideways, or upwards. This curious fact we have repeatedly witnessed, having kept these animals alive for many months: they were brought from Egypt, and lived perfectly well in the hot climate of Malta. The tail is long and prehensile; and the head is generally galeated, or raised in the form of a crest or hood. The whole of these extraordinary reptiles are confined to the hot latitudes of Africa and India, where they live entirely upon insects, and no doubt seldom or never quit the trees. The common species is said to have been found in the south of Spain.

(153.) The IGUANIDÆ, or Iguana lizards, are so called from the name given to many of them by the natives of Tropical America, where the most typical examples are found. The group, however, is a very large one, and comprehends several genera much diversified in appearance, but yet possessing many common characters. On a partial analysis of this group, we can come to no other opinion than that it accords with those we have elsewhere denominated families; and that its next division is naturally into genera, and not sub-families. Under this impression we shall arrange the whole under the five following families, which by our analysis turns out to be a perfect circle. Commencing with PLATYDACTYLUS, we pass, by means of the sub-genus *Phyllurus* Cuv. to STELLIO: the sub-genus *Cyclura* leads us (probably by *Amblyrhynchus*) to the two types of IGUANA; namely, *Basiliscus* and *Iguana* proper: *Ophryessa* passes into POLYCHRUS by means of *Brachylophus*: *Norops* again leads us to ANOLIS; from which, by means of *Stenodactylus*, we return again to PLATYDACTYLUS.

(154.) The *Platydictyli* are the geckos, or nocturnal lizards. Their flattened form and broad head gives to these reptiles a very striking and a peculiarly disagreeable appearance; hence, although timid and harmless, they are always regarded by the vulgar as venomous and

highly dangerous. Besides the depressed form of the body, they are eminently distinguished by having the feet palmated, or rather lobed and dilated into disks, analogous to the coots and phalaropes among birds, and to the crocodiles among reptiles: the toes, which are of nearly equal length, are generally terminated with retractile claws like those of rapacious animals; in the present case, however, this structure is not intended to secure their prey, which merely consists of weak insects, but to enable them to gain a firmer grasp. These disgusting little creatures are very commonly seen in Italy, running during night or in cloudy weather on the top of the ceilings of old mansions. The eyes are very large, and the pupil contracts from the influence of light like those of a cat: the jaws have a range of very small crowded teeth, but there are none in the palate: the skin resembles shagreen, and the eyelids, which are very short, give to their physiognomy a striking and peculiar aspect: the tail has circular folds, like that of the genus *Anolis*.

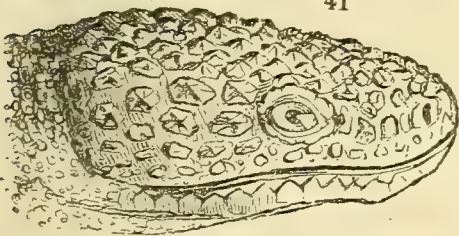
(155.) The genus *Stellio* has the depressed head and body of the geckos, and much of the same forbidding appearance; but their toes are not lobed, and their tails, although sometimes broad, are encircled by rings of strong spiny scales, which gives them a very peculiar aspect. The passage to these from the last group is beautifully marked by the broad-tailed lizard of New Holland; then comes the Indian *Uramastrix*, and the true stellios of Africa: the fourth sub-genus appears to be *Cyclura* Cuv., but we have not been able to determine the fifth. All these have a narrow neck, and in most cases a head much enlarged behind.

(156.) The next genus is *Iguana* proper: it is immediately to be distinguished from the last by the attenuated and ringless structure of the tail, by the prevalence of dorsal crests upon the back, and by the possession of palatine teeth. In one of the sub-genera (*Basiliscus*) the hind head is enlarged, as if it was covered

with a sort of helmet or hood, and a high fin-like crest extends along the back and tail of the males. They inhabit the Old World, while the true *Iguanas* are confined to the New. These latter are very large lizards, of a beautiful green colour elegantly varied, and with a hanging pouch under the throat, which seems analogous to the dew-lap of the oxen: this pouch can be inflated, but under what circumstances is not exactly known. All the sub-genera have the tail more or less surmounted with spines; but in the genus *Polychrus*, which next succeeds, the tail is not only simple and round, but is more or less prehensile: thus we see the chameleons represented under a different form; and having got a representation of the aquatic type, or *Emydosaures*, in *Platydictylus*, we find the scansorial at the other end of the circle, under the form of *Polychrus*. The genus which intervenes between the last and that of *Platydictylus*, appears to be *Anolis*, composed of the goitered lizards: we infer this for two reasons; first, because *Norops* seems to hold an intervening station between *Polychrus* and *Anolis*; and, secondly, because the goitered lizards have a small disk on each of their toes, thereby indicating their close relationship to the geckos: they are, however, differently formed in other respects, for they all have an enormous gular pouch, and some of them — perhaps the most typical — have a crest of spines similar to the true *Iguanas*. To connect these with the geckos, or nocturnal lizards, we make use of the sub-genus *Stenodactylus*, which evidently is an aberrant form, since the five types of *Platydictylus* are all furnished with disks to their toes. Nothing of popular interest, yet known, attaches to these reptiles, and we shall therefore proceed to the next family.

(157.) The LACERTIDÆ, or slender-tongued lizards, form a less numerous, but a much more elegant family than the last: their head is small, and is not larger in its circumference than the neck; hence there is no perceptible division between the head and body. This struc-

ture imparts an additional gracefulness to these elegant lizards, of which there is not a single example among those we have just left ; they are, moreover, without any of those dorsal crests of spines on the head, back, and tail, which are so common among the Iguanian lizards: none of them have gular pouches, and the tail, except in one or two genera, is invariably long, rounded, and smooth: the tongue is very long, more or less forked after the manner of serpents, and capable of much extension. Most of the European, and nearly all the British lizards belong to this group ; the genera and sub-genera of which, however, we have only partially analysed. The singular genus *Leiolepis* of Cuvier forms a beautiful passage between these and the *Iguanidæ*, by means of *Polychrus* : its tongue is highly singular, and shows the union of those characters which belong on the one hand to the *Iguanidæ*, and on the other to the *Lacertidæ*. There are no very large or remarkably shaped lizards in this family, except, perhaps, the *Hydrosaures*, or crocodile lizards, most of which are from South America. They derive their familiar name from being above the ordinary size, and having a low double crest of spines upon their compressed tail. Like their prototypes, also, they are mostly found among the rank herbage of savannahs, and on the sides of rivers ; the analogy is still further preserved by the scales of the *Hydrosaures* being irregularly hexangular, so as to resemble the plates or bucklers with which the skin of the crocodiles is defended. One of these, indeed, the *Heloderma horridum* (fig. 41.)



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has the scales upon the head and some parts of the body raised in the middle and angulated on the sides, so as to give a perfect miniature resemblance to the plates on

the shells of the tortoises. We are entirely unacquainted with that genus which should fill up the interval be-

tween *Hydrosaures* and *Leiolepis*, but we suspect that it will be composed of several of the sub-genera, which, at present, we have placed provisionally among the *Agamidæ*.

(158.) The SCINCODÆ, the skinks, or the serpent-lizards — the sixth and last family — are so called from their general resemblance to snakes, with which, in fact, the family is absolutely blended. They are immediately known by their very short feet, by their lengthened body and tail, and by being, for the most part, covered with serpent-like scales: the head is small and smooth, and the tongue is not capable of extension. As this is the group by which nature blends the lizards with the serpents, the feet, as being the principal mark of distinction between the two tribes, are subject to considerable variation in the minor groups: they are generally four, but sometimes only two; and even these frequently appear more as appendages than as perfect members. The scales are shining and imbricated; that is, laying one upon the other in the manner of tiles upon a roof. Besides, the palpable affinity which these reptiles bear to the slow-worms, or *Anguidæ*, is obvious to every one: and finally, the jaws are provided with a row of small and crowded teeth; but all these characters are subject to much variation, and several of them disappear, or assume new modifications in the minor groups. The common skink (*Scincus officinalis*) may be taken as a type well calculated to give the reader a tolerable idea of the whole family. As no general description, however, will give an accurate notion of the wonderful manner in which nature has advanced from the lizards to the serpents, we shall enter into some of the details of the five principal groups into which, with Cuvier, we have arranged these reptiles; namely, — 1. *Scincus*; 2. *Seps*; 3. *Bipes*; 4. *Chalcides*; and 5. *Chirotes*.

(159.) The first is the genus *SCINCUS*, or the galley-wasps of the West Indies. They have four short but strong feet: the body is almost of equal length with the tail: the head and throat are not swelled, nor is the former

furnished with a casque or crest, like that of the chameleons. In some, the shape of the body is fusiform; but in others it is more or less elongated; while several put on nearly the cylindrical form of serpents, closely resembling, in general aspect, the *Anguidæ*, or slow-worms. The toes of the feet are unconnected, except at their very base, and are all provided with claws: the muzzle in some, as in the common skink (*S. officinalis*), is sharpened and raised; but in others (as *S. rufescens*) it is obtuse or blunt. The sub-genus *Tiliqua* Gray, differs from the former by having no teeth in the palate.

(160.) The *Seps* differ from the skinks, properly so called, by having a more serpent-like body, perfectly similar to that of the blind-worm: the feet, also, are still smaller: another advance is made towards the serpents by the lungs being somewhat unequal: the feet have five toes, the hinder of which are unequal; but in the sub-genus *Lygosoma* these members are much shorter, and of nearly the same length. In *Tetradactylus*, one of these toes disappear, leaving but four; and these, again, are reduced to three in the *Tridactylus decresiensis*: the same number of toes are seen in the sub-genus *Zygnis*, but then they are remarkably small, and the feet are very short. Finally, in the *Monodactylus anguina*, the toes altogether disappear; and this reptile has no other vestige of feet, than what M. Cuvier terms small stilets, which are not divided at their extremity. This curious reptile inhabits Southern Africa.

(161.) The *Bipes* seem to form a third division of the family: we now enter upon reptiles so similar to snakes, that, as M. Cuvier observes, there seems but one step from them to the slow-worms. In fact, this genus, with all the habit or general aspect of a *Seps*, nevertheless is entirely destitute of fore feet, the indications of which, however, may be detected by the omoplates and clavicles which are concealed under the skin: the hind feet still remain visible, but they are so small as to appear almost useless. In the sub-genus *Pygopus* there is a range of pores in front of the vent.

In this group, M. Cuvier places the *Bipes lepidopodes*, an extraordinary reptile of New Holland, which he thus notices : “ The scales of the back are carinated, and the tail twice as long as the body. Its feet at the exterior exhibit only two small oblong and scaly plates, but by dissection may be found a femur, a tibia, a peroneum, and four bones of the metatarsus, forming toes, but without phalanges ; one of the lungs is only half as large as the other. It lives in mud.” (*Griff. Cuv.* p. 161.) The scales of the body are not mentioned, and unfortunately we cannot find a specimen of this interesting reptile in the London Museums. Is it not the type of the sirens and *Amphibia* among the *Saures* ? But to proceed: the African *Scelotes* of Fitzinger is a *Bipes*, destitute of pores, but whose feet terminate in two unequal toes ; while *Pygophus*, a Brazilian genus, resembles *Lepidopoda* in its undivided, but more pointed feet, and all the scales are smooth. Wagler gives the generic name of *Bipes* to a reptile (*Lacerta apoda* Pall.) which by no means agrees with the definition of Cuvier, inasmuch as it is entirely destitute of feet, the situation of the hinder pair being, however, marked by the rudiments of very short thighs, so that the metatarsus is obsolete. (See *Icon. Amph.* pl. 14.) All these sub-genera, indeed, require a complete revision.

(162.) The *Chalcides*, like the *Seps*, are very elongated lizards, with an appearance very similar to serpents ; but their scales, instead of being imbricated, are rectangular, and form (like those of the tail in common lizards) transverse bands, distinctly marked. The number of toes are variable in the different sub-genera. The first division of this group have a furrow on each side of the trunk, and the tympanum is very apparent. They are related to *Cordylus* as the *Seps* are to the skinks, and in many points of view appear to conduct us to the *Ophisauri* and *Pseudopoda*. The *Lacerta seps* of Linnaeus, which is considered the type, has five toes, but the *Saurophis* of Fitzinger has but four. The second division has the tympanum concealed, and seem to lead

directly to the *Bimanes*, and through them to the slow-worms: here again, as in the former division, we find several small sub-genera, mostly founded upon a single species. One has five toes; another four on the anterior feet, and five on the hinder: one also has but four toes on all the feet. Finally, so little dependence can now be placed on organs, which, in other natural groups, serve to characterise classes and orders, that we come to a species where some individuals have three toes, others five, and others again but one. Such, at least, is the opinion of M. Cuvier, who notices this extraordinary fact nearly in the following words: "The *Chalcide* figured by Lacepede (pl. 32.) has five toes before, and three behind; but these toes are so exceedingly minute, that they are reduced to small tubercles, and are so little apparent, that the species has been regarded sometimes as having three toes, and sometimes but one." (*Griff. Cuv.* p. 162.) It has thus been formed into three different genera by the continental methodists, having received the names of *Chamæsaura*, *Chalcis Cophias*, and *Colobus*!

(163.) The last division are the *Chirotæ*. They resemble those reptiles we have just quitted in their verticillated scales, but they are distinguished from them by wanting the hind feet: in other respects they agree with the *Amphisbænæ*, particularly in the obtuse form of their head; but then, again, they differ in possessing two short anterior feet, which those serpents are without. Of this division, only one species is known: the *Chirotæ lumbricoides* (*Lacerta lumbricoides* Shaw), a native of Mexico. Its organisation is very peculiar: it is eight or ten inches long, as thick as the little finger, flesh-coloured, and covered with about 220 semi-rings on the back, and as many on the belly, which meet on the sides. The feet are four-toed, with the vestige of a fifth: they are attached by omoplates, clavicles, and a small sternum; but the head, vertebræ, and the rest of the skeleton resembles the *Amphisbænæ*: the tongue is slightly extensible, and ends in two small

horny points: the eyes are very small, and the tympanum completely covered by the external skin: the lungs are unequal, as in the generality of serpents, one being large, the other very small.

(164.) The last family we have named the AGAMIDÆ, or frog-lizards, thereby intending to denote the fat-bodied groups of which the orbicular lizards of Cuvier form the type (*Phrynosoma* Wagler). Hitherto, however, they have never been thus designated; and not having personally examined several of the sub-genera, we have not been able to give the contents of this group that degree of finish which hereafter we hope to accomplish. Generally speaking, they are mostly short-tailed depressed lizards, with large bellies, narrow necks, and widened heads, so as to resemble, in a great measure, some of the IGUANIDÆ; they have not, however, the palatine teeth which distinguish *Iguana*, or the broad spiny-ringed tails of *Stellio*. Some few of the sub-genera, indeed (forming the genus *Lophyura* Gray), have spiny crests upon the back and tail, but we feel by no means sure that these should not be transferred to the *Iguanidæ*, near to *Brachycephalus*. Certain it is, however, that there is a decided affinity between the skinks, or the SCINCOIDÆ, and *Tropidurus* Wieg.* This being admitted, we have next to ascertain if any, and what, lizards evince an affinity with the chameleons, because it is to that family that, in a circular course, we are to return. Now there can be no question that this affinity is shown in the sub-genus *Lyriocephalus*, where we have the head and the peculiar telescopic eyes of the chameleon, joined to the body, covered with imbricate scales of an *Agami*. Our only remaining difficulty, therefore, is to trace the connection between these two extreme groups: this we have endeavoured to

* MM. Dumeril and Bibron have observed regarding Mr. Gray's genus *Lyriocephalus*: "Ils ont avec les Scinques une certaine ressemblance que nous allons trouver complète dans les premières espèces du genre suivant celles qui forment le groupe des *Proctotrupes Leiodères* (*Tropidurus* Wieg.)." *Erpétol. Gén.* tom. iv. p. 260.

do in our systematic arrangement, where it will appear that the genus *Draco* stands as the most aberrant of all, occupying, in this respect, precisely the same situation in the circle of the *Agamidæ*, as the *Pterodactyli*, or flying lizards, hold in that of the ENALOSAURES. The intervening forms which appear to connect all these sub-genera with *Tropidurus* on the one side, and *Lyriocephalus* on the other, will be seen in our synopsis.

(165.) Some of the most singular shapes among the existing races of reptiles will be found in this family. The *Phrynosoma*, with its fat body and short tail, immediately reminds us of a toad. *Megalochilus* has much of the same shape, but seems to have a large pair of rounded ears standing out from the sides of the head. Those of the sub-genera of *Draco* are most extraordinary reptiles: the *Sitana* has an enormous pouch under the throat, which it can swell out so as to appear like a *Tetraodon*, or porcupine-fish. *Clamydosaurus*, again, is provided with an immense fringe round the throat, perfectly resembling the broad collars worn by ladies of the present day. The flying lizards (*Draco*), however, even surpass these, for they possess a distinct pair of wings, attached to the sides of their body, supported by rays, and capable of being expanded or folded at pleasure. These extraordinary reptiles, however, are by no means formidable: they are all of a comparatively small size, live in trees, and feed only upon insects. Of their peculiar habits, however, in other respects, we unfortunately are at present ignorant. There can be no doubt that these wings are used to support them in the air, when leaping from bough to bough, much in the same manner as the loose skin performs that office among the flying squirrels.

(166.) The philosophic naturalist will not fail to perceive that all the peculiarly-formed reptiles contained in the last family, are representations of such other animals only as, in their own circles, come in as the most aberrant type of all the five that form a circular group. Thus the dragons represent the *Triglidæ* among

fish, whose pectoral fins, as it were, are turned into wings. *Sitana* is a perfect prototype of the *Diodons*, *Tetraodons*, and other cheloniform fishes of the order *Plectognathes*. Some of the *Agamidæ* have their bodies covered with spines, and thus remind us of the hedgehogs and globe-fish (*Diodon*) ; while *Phrynosoma*, and the other orbicular lizards, represent the amphibian frogs. This, in short, is perhaps the most interesting group in the whole circle of the saurian reptiles ; and would repay, in popular and philosophic interest, more than any other, the labour of a complete and searching analysis of the whole, with reference both to its affinities and analogies.

(167.) Thus fortified in our conviction that the natural arrangement of the reptiles would be in perfect unison with that of all the other vertebrated animals, we shall now compare the families of the saurians, or lizards, with the other groups here indicated.

Analogies of the Saurian Lizards.

Families of Lizards.	Analogies.	Orders of Birds.	Classes of the Vertebrata.	Orders of Fishes.
LACERTIDÆ.	Climbers.	<i>Insessores.</i>	BIRDS.	<i>Malacop.</i>
IGUANIDÆ.	Terrestrial.	<i>Raptores.</i>	QUADRUPEDS.	<i>Acanthop.</i>
SCINCOIDÆ.	{ Feet very short ; scales imbricate. }	<i>Natatores.</i>	FISH.	<i>Apodes.</i>
AGAMIDÆ.	{ Throat large; tail short, }	<i>Grallatores.</i>	AMPHIBIANS.	<i>Plectog.</i>
CHAMELEONIDÆ.	{ Tail highly deve- loped. }	<i>Rasores.</i>	REPTILES.	<i>Cartilag.</i>

In groups so immensely remote and dissimilar our surprise must be excited at discovering so many points of analogy as the above table discloses, rather than our disappointment be expressed at not comprehending others. We have but scanty room for a full exposition of this table, but a few remarks may possibly put the reader on the road for discovering more. The *Lacertidæ*, as a whole, are the most expert climbers, for they run with ease up walls and trees perpendicularly, while the typical

Iguanidæ, from not having that power, always keep on the ground. These facts we know from personal observation ; they are, moreover, without those dorsal spines common to the *Iguanidæ*, and hence these two divisions represent the two typical orders of fishes, one having spines in their dorsal fins, the other none. The fish-like scales of the skinks, and their short, often obsolete feet, at once explains *their* analogy, as the short tail and frog-like aspect does of the *Agamidæ* to the *Amphibia* ; their large and dilatable throat also makes them represent the *Plectognathes*, or balloon fishes. But of all the analogies to be found in the whole class of reptiles, those of the chameleons are so remarkable, that we shall bring them in more detail before the reader.

(168.) The chameleons are as perfect representatives of the parrots and the scansorial tribe of birds as it is possible to conceive in two such different classes of animals. Different shades of green is the predominant or ground colour of both. In parrots it changes into different tints, according to the direction in which it is viewed. The same change is observed in the chameleons, but produced in a totally different way. The tongues of both are thick and fleshy : among birds this is a very unusual structure ; and as the chameleons, by representing the parrots, necessarily typify also the *Scansores*, we find that their tongue exhibits the two great characteristics of that tribe of birds: it is thick and fleshy, like that of the parrots, but by its extraordinary powers of prolongation, it preserves at the same time a perfect analogy to the woodpeckers, the most typical family of the climbing birds. Let it be remembered also, that no other reptiles, or no other birds, possess this greatly extensible tongue, besides the chameleons in the one class, and the woodpeckers in the other. If we look again to the tail, we find another beautiful analogy. This member, although totally different in each, nevertheless performs precisely the same functions to both animals : the convolute form it assumes in the chameleon, is for the purpose of entwining round neighbouring bodies, as branches of

trees, &c., and of assisting the animal while climbing. Now such is the precise use of that singularly rigid tail given to the woodpeckers : it cannot, indeed, be employed in clasping, but its stiff feathers are pressed against the trunks of trees ascended by the bird, and thus supports the body while in a perpendicular position. In both animals it acts as a backward hand. We need only consider the manner of feeding, and the structure of the feet, in the woodpeckers, the parrots, and the chameleons, to admire how beautifully nature has made them representatives of each other. The toes of the chameleons, as we have already described, differ from those of all other reptiles in being divided into two parcels, one placed opposite the other : by this peculiar formation, the animal obtains an equal grasp all round the object upon which it trusts for support. Now this structure, so admirably adapted for climbing, is the great characteristic of scansorial birds, but more especially of the parrots ; where, as in the chameleon, the soles of the feet are flat, and very broad. But however strangely these reptiles evince their relationship to the *Psittacidæ* in their feet, they present us with a still more remarkable analogy to the typical climbing birds. Setting aside the similarity of their food, which is exclusively confined to insects, the mode of capturing it, in both animals, is not only precisely the same, but is entirely different from that pursued by all other birds and reptiles. The tongue is of an extraordinary length, fleshy, worm-shaped, and tipped with a viscid fluid ; it can be thrown, by certain peculiar muscles, to a distance of many inches beyond the head, and, striking with unerring accuracy, the insect in view, it is withdrawn instantaneously to the mouth : we have witnessed this in the chameleon, and every one knows that woodpeckers feed in the same way. Even the crested or helmet-shaped head of the chameleons may be explained by comparing them with those ornithological groups which they represent. The *Scansores*, or climbers, the *Rasores*, or the Gallinaceous order, possess these ornaments or appendages in a pre-

eminent degree, and impart them almost universally to all genera having similar analogies : nearly every species of woodpecker has the head more or less crested, while in the hornbills, equally representing these groups, the crest assumes the form of a bony or keel-shaped helmet, as similar to that of the chameleons as can well be supposed. Nor is the analogy of the chameleons to the *Scansores* an isolated resemblance in their own circles : traces of a mutual relation between the other groups may be detected, as the following table will show :—

Analogies of the Chameleons.

Families of Lizards.	<i>Analogies.</i>	Tribes of Perchers.
Chameleonidæ.	Feet syndactyle; tail prehensile.	Scansores.
Agamidæ.	{ Throat dilated, often ornament- ed with a fringe. }	Tenuirostres.
Scincoidæ.	Feet remarkably short.	Fissirostres.
Lacertidæ.	Climb among trees.	Insessores.
Iguanidæ.	{ Claws long, sometimes retractile } { in the lizards ; never climb. }	Raptores.

The only birds which, as a whole, have their wide throats ornamented with ruffs of feathers, are the humming-birds and the common ruffed sandpiper, both being tenuirostral types. *Clamydosaures*, *Sitana*, and even *Draco* thus find their analogies among the humming-birds. The three other columns singularly agree, for the *Lacertidæ*, like the *Insessores*, have the greatest powers of prehension, while the offensive nature of the dorsal spines in the typical *Iguanidæ* evince to us that one type in the circle is hurtful, though far less so than the *Crotalidæ*, or poisonous snakes among the serpents, which again represent the *Iguanidæ*, by their large and heart-shaped head, and their narrow neck. In the fork-tongued lizards, on the contrary, as well as in the *Coluberidæ*, or harmless snakes, the head is small, without any external separation from the trunk. We could pursue this most interesting subject much further, did our space permit. But enough has

been said to excite the attention of every one who prefers the enlarged and philosophic contemplation of nature, rather than to dwell on her minutiae. Such minds will be at no loss to discover, and will delight to trace, beneath the superficial aspect of animals, whether internal or external, inexhaustible proofs of the symbolical similitudes of every thing that proceeds from INFINITE PERFECTION.

PART II.

THE NATURAL ARRANGEMENT OF THE CLASSES OF
FISHES, AMPHIBIANS, AND REPTILES.

CHAPTER I.

A SYNOPSIS OF THE NATURAL ARRANGEMENT OF FISHES.

IN the following Synopsis I have endeavoured to select the most essential character of each division, from the more detailed arrangement which follows. This was the invariable plan pursued by the great zoologists and botanists of the last century; and if it facilitated research in those days, how much more necessary is it in these, when the genera have become so numerous as frequently to perplex the more experienced naturalist, and always to occasion much trouble. The ORDERS follow each other in their circular series, commencing with the *Acanthopteryges*, and ending with the *Apodes*.

ORDER I. ACANTHOPTERYGES.

Dorsal fins with spinous rays.

TRIBE I. MACROLEPTES.—Scales conspicuous, smooth; branchial aperture large.

FAMILY 1. PERCIDÆ.

Fins naked; preopercule serrated; covers spined; form oblong.

1. Sub-family PERCINÆ. *Perches*.—Dorsal fins two, distinct; no canines.

PERCA. Linn. Mouth large; form oblong or fusiform.

Perca.* Caudal fin lobed or lunate.

Lates. Caudal fin rounded.

Centropomus. Anal spines very large.

Nippon.† Spines on the gills very large.

Lucioperca. Large teeth intermixed with smaller.

* Including *Labrax*.

† Including *Centropomus*.

ENOPIOSUS. Mouth small; form short, broad, and oval.

Diplopteron. Head broad and high; caudal rounded.

Enoplosus. Like a *Chætodon*; head and mouth very small; dorsals high.

Gramistes. Oval; scales very small, covered by the skin; caudal round.

ASPRO. Form slender; muzzle depressed; mouth beneath.

HURO. Broad; mouth large, sub-vertical; lower jaw longest.

Huro. Preoperculum entire.

Ambassus. Anal fin lengthened; ventral before the pectoral.

APOGON. Head and body thick; eyes very large; tail long.

Apogon. Anal fin beneath the second dorsal.

Pomatomus. Anal fin behind the second dorsal.

Cheilodipterus. Teeth as in *Lucioperca*; dorsal fins short.

2. Sub-family **SERRANINÆ**.—Dorsal fin single, emarginate; jaws with canines; preopercule crenated; opercule with prickles.

SERRANUS. Body fusiform; fins without scales or basal sheath.

Serranus. Caudal fin truncate, or slightly lunate.

Chromileptes. Caudal fin rounded, or semi-oval.

Plectropoma. Teeth of the preopercule pointing forwards.

Cynichthys. Head large, obtuse; mouth sub-vertical.

Variola. Ventral and caudal fins very long, the latter forked.

PENTACEROS. Body short, broad, resembling a *Chætodon*; scales small.

Polyprion. Body broad, compressed, triangular; orbits horned.

Pentaceros. Body ovate; orbits and ventral spine serrated.

ACERINA. Muzzle prominent beyond the mouth; lower jaw short.

GRYSTES. Dorsal fin deeply cleft; mouth sub-vertical; preopercule smooth.

ETELES. Fusiform; eyes very large; caudal deeply forked.

Elastoma. Teeth as in *Serranus*; dorsal deeply cleft; caudal divisions equal.

Eteles. Several large incurved teeth in the jaws; caudal divisions unequal.

Urophæton. Two middle rays of the caudal forming a long filament.

3. Sub-family **PERCOPHINÆ**.—Ventral before the pectoral; dorsal spines few.

PERCOPHIS. Dorsal fins two; body slender, anguilliform.

PERCIS. Dorsal fin single, very long.

Percis. Slender, fusiform, shape of a *Labrus*; lips thick and fleshy.

Pinguipes. Sub-fusiform; head thicker, somewhat obtuse.

Rypticus. Scales nearly hid by the common skin.

CENTROPRISTIS. Broadly fusiform; caudal large, doubly lunate.

PRIACANTHUS. Mouth large, vertical; lower jaw longest; ventral large.

4. Sub-family **HOLOCENTRINÆ**.— Scales hard, ciliated; several large spines generally placed on the head or gill-covers.

ANTHIAS. Caudal fin large, lunate; head obtuse; mouth sub-vertical.

HOLOCENTRUM. Scales large, crenated or serrated, and imbricate.

Holocentrum. Very large spines on the gill covers; caudal forked.

Corniger. Sub-orbital spines very large; caudal truncate.

Myripristis. Mouth sub-vertical; spines of the head small.

Hoplostethus. Scales small; head very large, with sunken partitions.

TRACHICHTHYS. Body covered with large rough plates.

Trachichthys. Lateral line and belly carinated.

Monocentrus. Anal and dorsal spines very thick; mouth small.

ORIOSOMA. Body covered with conic tubercles; belly prominent.

BERYX. Dorsal fin single, short; the scales regular and smooth.

5. Sub-family **DATNINÆ**.— Teeth small, close, and even; dorsal single; pectorals pointed.*

THERAPON. Strong spines on the operculum.

DATNIA. Base of the hinder fins generally with a scaly sheath.

Pomotis. Body broad; a membraneous flap on the opercle

Datnia. Dorsal and anal spines remarkably strong.

Pelates. No scales on the fins; anal spines moderate.

Helotes. Muzzle obtuse; mouth small; teeth trilobate.

CIRRHITES. Pectorals with the lower rays thick, simple, and nearly free.

CENTRARCHUS. Mouth sub-vertical, large; anal spines numerous.

DULES. Dorsal fins almost cleft into two; eyes very large; caudal forked; general external aspect of *Am-bassis*.

Affinities uncertain; Pectoral and Anal Fins pointed; Caudal lunate or forked.

DIACOPE. Preopercule crenated, sharply emarginate; opercule with a tubercule.

MESOPRION. Preopercule crenated, and simply lobed.

* Except in *Cirrhit*es, where they are digitated.

FAMILY 2. CHÆTODONIDÆ.

Operculum generally smooth, or without prickles*; spinal rays of the dorsal fin fewer than the flexible rays; body generally oval; mouth small.

1. Sub-family CHÆTODONIDÆ. — Short, broad; fins covered with scales; teeth setaceous. †

CHÆTODON. Operculum smooth, or without spines.

Microcanthus. Anterior dorsal fin naked; operculum minutely crenated.

Chætodon. Dorsal fin of nearly equal breadth throughout.

Rabdophorus. Dorsal fin prolonged into a whip-like filament.

Zanclus. Dorsal fin very falcate; snout produced; scales obsolete.

Chelmon. Snout excessively prolonged.

HOLOCANTHUS. Operculum denticulated, or strongly spined.

Heniochus. Dorsal fin falcated; front horned; scales distinct.

Pomacanthus. Operculum serrated; dorsal fin attenuated behind.

Holocanthus. Operculum with a large spine; caudal rounded.

Genicanthus. Operculum spined; body lengthened; caudal forked.

EPHIPPIUS. Dorsal fins partly naked; front gibbous, truncate.

Drepane. Pectoral fins very long and falcate; caudal truncate.

Monodactylus. Soft rays of the ventral fins almost obsolete.

Platax. Ventral fins generally very long and falcate.

Ephippus. Dorsal fins two, with minute prickles before; pectorals small, rounded.

Scatophagus. No spines before the dorsals, which are united; pectorals pointed.

TOXOTES. Body oblong; mouth large, sub-vertical; lower jaw longest.

Toxotes. Dorsal fin close to the caudal; caudal truncate.

Pempheris. Dorsal fin short and high, placed over the pectoral.

Brama. Dorsal fin long, falcate; caudal forked.

GERRES. General aspect of Sparus; mouth very protractile; dorsal fins sheathed or scaled at the base; caudal deeply forked; teeth setaceous.

Gerres. Dorsal fin sheathed, its anterior and anal spines very strong.

Cæcio. Small scales extending half-way up the dorsal.

Mena. Fusiform; dorsal naked; teeth minute.

Smaris. Resembling Mena, but no teeth on the vomer.

2. Sub-family SCIÆNINÆ. — Gill-covers spined; preoperculum serrated, resembling the Percidæ, but the vomer and palate without teeth.

GLYPHISODON. General form of Chætodon, but the teeth are strong.

Pimelepterus. Ovate, oblong; dorsal fins two; snout obtuse, notched.

* Except in *Toxotes*.

† Except in the SCIÆNINÆ.

- Glyphisodon*. Caudal large, forked; anal fin short; vent medial.
Microgaster. Caudal lunate; anal fin long; vent near the pectoral.
Chrysiptera. Snout obtuse; caudal rounded; pectorals large, pointed.
Chætolabrus. Oval; lateral line interrupted; caudal and pectoral round.

PLECTORYNCHUS. Ovate, oblong; dorsal fin single; operculum with prickles. Resembling the perches.

- Plectorynchus*. Ventral and pectoral equal; anal very short and scaled.
Pristopoma. Ventral fins small; anal spines very strong.
Hæmulion. Oblong, fusiform; lower jaw with pores.
Lobotes. Broad and ovate; eyes and head small; mouth oblique.
Latilus. Dorsal fin long, with only a few short and weak spinal rays.

SCIÆNA. Ovate, oblong; dorsal fins two; spines of the anal fin very slender.*

- Sciæna*. Tail and caudal rather elevated and truncated; no canine teeth.
Otolithus. Mouth large; under jaw longest; strong canines; caudal rounded.
Ancylodon. Dorsal fins very remote; head without scales.
Nebbris. Dorsals united; body slender; no canines; eyes very small.
Leiostomus. Snout truncate; caudal lunate; no canines.
Eques. First dorsal fin short, falcate; second very long and equal.

LEPIPTERUS. Dorsal fins two; spines of the anal fin very large.†

- Larimus*. Profile symmetrical; snout not truncated; no canines.
Lepipterus. Slender, fusiform; scales minute.
Corvina. No long canines in front; ventrals large, pointed.
Umbrina. Ventral profile hardly curved; lower jaw with a single cirrus.
Pogonias. Several cirri on the chin; ventral large and rounded.
Micropogon. Chin with several cirri; anal spines small.

AMPHIPRION. Gill-covers very strongly serrated and spined; sub-orbital plate crenated or toothed.

- Amphiprion*. Mouth often sub-vertical; operculum strongly toothed.
Premnas. Sub-orbital plate with a strong simple spine.
Pomacentrus. Profile symmetrical; operculum edge smooth; caudal emarginate.
Scolopsides. Sub-orbital spine serrated; body fusiform.
Cheilodactylus. Pectoral fins angular; some of the rays lengthened.

3. Sub-family SPARIANÆ.—Gill-covers smooth; all the fins naked; teeth generally strong; pectorals long and pointed.

CHRY SOPH RYS. Head and back high; snout obtuse; strong grinders on the palate.

- Chrysoblepus*. Head large, obtuse; profile sub-vertical; crown gibbous.
Chrysophrys. Head small, and much narrower than the body.
Pagrus. Broad, but the crown not gibbous; front teeth small and even.
Argyrops. Anterior dorsal spines with long filaments.
Calamus. Head large; second anal spine hollow, pen-shaped.

* This arrangement is artificial.

† Except in *Micropogon*.

SARGUS. Front teeth large, compressed, and cutting; grinders on the sides.

Charax. Jaws rather produced; front teeth pointing forwards; side teeth minute.

PAGELLUS. Body more fusiform; canines crowded, conic, and slender.

Lithognathus. Maxillaries enlarged and very hard.

Boridea. Lengthened, fusiform; dorsal fin cleft, the first triangular.

Lethrinus. Large conic canines in front; head naked; grinders in one row.

SPARUS. Operculum smooth; no grinders in the jaws or palate.

Sparus. More or less fusiform; front teeth even, entire, or emarginate.

Dentex. Some strong conic teeth in front; dorsal slightly emarginate.

Nemipterus. First dorsal fin prolonged into a filament.

Oblata. Mouth oblique, small, as in Sparus; lower jaw longest.

Asphareus. Mouth very large; lower jaw strong; upper shortest.

4. Sub-family SCARINÆ.—Large plates or scales at the base of the caudal fin; jaws tooth-like.

ZIRICHTHYS. Crown high; profile obtuse; teeth as in Labrus.

Zirichthys. Crown very high; profile almost vertical; dorsal pointed in front.

Thalassoma. Muzzle suddenly advanced; ventrals longer than the pectorals.

Malacanthus. Body elongated, dorsal spines low, very few; caudal lunate.

Crassilabris. Head and lips very thick; forehead slightly gibbous; caudal short, rounded.

Urichthys. Caudal fin very large, the rays extending beyond the membrane.

SCARUS. Jaws with no true teeth; all the dorsal rays soft.

Scarus. Head large; crown elevated, gibbous; caudal lunate; all the dorsal rays branched.

Hemistoma. Head and crown sub-oval; the fore dorsal rays simple and flexible.

Leptoscarus. Body slender, elongated, fusiform; scales sub-triangular.

Calliodon. Mouth sub-vertical, retractile; profile obtuse, caudal rounded; ventrals small.

PETRONASON. Dorsal fin with spiny and branched rays.

Chlorogaster. Head obtuse; front gibbous; caudal fin lunate.

Petronason. Muzzle sub-ovate; crown not elevated; caudal fin lunate.

Erythys. Nostrils ciliated; caudal rounded.

Sparisoma. Like Petronason, but with sharp incisors and obtuse canines.

OSTORYNCHUS. Jaws considerably elongated, the under longest.

AMPHISCARUS. Ventrals with two spinal rays; jaws as in Scarus.

5. Sub-family LABRINÆ. *Labrus*. — Lips very thick and fleshy; teeth acute; colours brilliant; not silvered.

LABRUS. Head covered with scales; operculum smooth; ventrals small; front incisors large.

Labrus. Dorsal fin naked, not falcated; lateral line abruptly bent.

Lachnolaimis. Dorsal fin with the anterior rays falcated.

Cheilinus. Dorsal, anal, and caudal fins scaled; lateralline interrupted.

Hemiulus. Dorsal fin low, equal, all the rays soft and branched.

Cychla. Mouth large, sub-vertical; lower jaw longest, jaws protractile; fins naked.

CRENILABRUS. Body shorter, more compressed; preopercule denticulated.

Cynædus. Caudal and pectoral fins rounded; preoperculedenticulated.

Crenilabrus. Caudal fin forked or lunated; preopercule denticulated.

Chromis. Pectoral and anal fins very long and pointed; caudal forked.

Chlorurus. Caudal forked; fins scaly; preopercule smooth.

Astronotus. Lower jaw longest; mouth obtuse; fins very scaly.

PLESIOPS. Ventral fins very long and pointed; teeth slender, equal, setaceous.

Labristomus. Teeth as in *Labrus*; nearly all the dorsal rays soft.

Chromis. Pectorals long and pointed; teeth setaceous; caudal lunated.

Cichlaurus. Mouth oblique; caudal rounded.

Plesiops. Dorsal spines resembling finlets; ventrals very long.

* Mouth tubular or very long.

GOMPHOSIS. Mouth slender, long, and permanently tubular.

** Mouth tubular by protraction; fins covered by scales.

Epibulus. Teeth as in *Labrus*; scales large; lateral line interrupted.

Clepticus. Body oblong; head obtuse; teeth obsolete; lateral line curved.

JULIS. Head and gill-covers destitute of scales.

Halicores. A strong canine at the base of the upper jaw pointing outwards.

Julis. Dorsal fin elevated or falcated in front; caudal rounded.

Icthycallus. Dorsal fin shortest in front; caudal truncate or round.

Chlorichthys. Caudal lunated, the two extremities pointed.

Anampis. Front incisive teeth flat, obtuse, and turned outwards.

Eupemis. Body slender; head long; lateral line oblique.*

FAMILY 3. MUGILIDÆ.

Muzzle obtuse, projecting beyond the mouth.

MUGIL. Cylindrical; dorsal fins two, remote; pectoral long.

POLYNEMUS. Slender detached rays, like filaments, at the pectoral fins.

FAMILY 4. MULLIDÆ.

Gill-covers smooth; two long cirri under the chin.

Mullus. Profile high, sub-vertical; head broad.

Upeneus. Profile attenuated; head narrower.

* This singular type seems related to *Hemiulus*, *Clepticus*, and *Julis*; its situation is very doubtful.

FAMILY 5. SPIROBRANCHIDÆ.

Belly remarkably short; vent near the pectoral.

MACROPODUS. Tail or caudal fin excessively large and forked.

COLISA. Ventral with one very long ray; the others minute or obsolete.

Trichopus. Dorsal fin very short, central.

Colisa. Ventral fins of a single long filiform ray.

Osphromenus. Ventrals of one very long, and several short rays.

Polycanthus. Ventral fins moderate and only pointed.

HELOSTOMA. Ventral fins rounded, and smaller than the pectorals.

Helostoma. Mouth very small and retractile; the teeth on the lips.

SPIROBRANCHUS. Mouth larger.

Spirobranchus. With tessellated teeth; body more lengthened, rather round; operculum not denticulated.

Anabus. Margin of the operculum strongly serrated.

OPHICEPHALUS. Body eel-shaped; all the fin-rays soft.

TRIBE II. — MICROLEPTES. — Scales small, or none; branchial aperture large.

FAMILY 1. SCOMBERIDÆ.

Body oblong, lengthened, smooth; caudal fin large, forked; dorsal fins often divided into finlets; no spines before the anal fin.

1. Sub-family **SCOMBERINÆ.** — Scales minute, uniform; dorsals wide apart.

SCOMBER. Body fusiform; scales uniform, minute; tail not keeled.

AUXIS. Dorsal fins distant; the first short.

2. Sub-family **THYNNINÆ.** — Scales largest near the head; dorsals approximate.

THYNNUS. Tail with two elevations and a carinated ridge between.

Orcynus. Pectorals very long, falcate.

Pelamis. Resembling Thynnus; with the teeth of Cybium.

Cybium. Elongated; scales equal; teeth large, compressed.

THYRSITES. Lower jaw longest; tail not carinated.

Gemphylus. Body very long; ventrals minute; lateral line with large scales.

ZYPHOTHYCA. Body sword-shaped; chin long and pointed; ventrals minute.

3. Sub-family XIPHIANÆ. Jaws greatly produced, sword-shaped, the upper longest.

XIPHIAS. Ventral fins wanting.

TETRAPTERUS. Ventrals formed of a single bony ray.

HISTIOPHORUS. Ventrals of two connected rays.

ZANCLURUS *Sw.* Scales hard, oblong; ventrals of two long equal rays.

MACHÆRA. No ventrals; snout short.

4. Sub-family ALEPISaurINÆ.—Body long, linear, thin; a second adipose fin.

ALEPISAURES. Lower jaw long; chin pointed; first dorsal very high.

5. Sub-family FISTULARINÆ.—Jaws excessively lengthened; mouth terminal.

FISTULARIA. Body smooth; without spines on the back.

FAMILY 2. ZEIDÆ.

Body either oval or rhomboid; scales often conspicuous; back spined; strong anal spines.

1. Sub-family MASTECEMBLINÆ.—Body somewhat anguilliform; snout produced.

RHYNCHOBELLA. Dorsal and anal separate from the caudal.

MASTECEMBLUS. Dorsal, caudal, and anal fins united.

NOTOCANTHUS. A row of spines representing the dorsal fin.

2. Sub-family AULOSTOMINÆ.—Lateral line mailed, or the jaws very long.

AULOSTOMA. Jaws very long, tubular; lateral line smooth.

Polycanthus. Jaws long; lateral line carinated; body five-sided.

GASTEROSTEUS. Sides of the body with imbricate plates.

Leiurus. Sides of the body smooth.

3. Sub-family SPHÆRINÆ.—Body long; dorsal fins two, remote; lower jaw longest.

SPHÆRINA. Body anguilliform; lower jaw longest, pointed; teeth large.

ATHERINA. Mouth obliquely vertical; head very obtuse.

CHIROSTOMA. Mouth nearly horizontal; head pointed. (A. Humboldtiana Cuv.)

4. Sub-family **CENTRONOTINÆ**.—Body lengthened, oblong.

ELACATE. Body long, slender, with many dorsal spines; mouth wide; lower jaw longest.

* No detached anal spines; dorsal single.

Tetragonurus. Scales hard, ciliated, grooved; mouth sub-vertical.

Elacate. Scales soft, minute; lower jaw longest.

Meladerma. Scales minute, not imbricate; lower jaw shortest.

* * Detached anal spines.

Chorinemus. Body elongate; no scales; tail with finlets.

Porthmeus. Body ovate; dorsal spines almost connected into a fin; gape opening beyond the eye.

CENTRONOTUS. Dorsal fin single, with isolated spines before; body ovate, oblong; mouth small.

Trachinotus. Oblong-oval; snout short, obtuse, truncate.

Centronotus. Snout rather pointed; head narrowed; mouth small.

Lichia. Oblong; mouth large, oblique; lower jaw longest.

Scorpi. Oval, resembling a *Chætodon*; fins scaly; teeth strong.

Naucrates. Sides of the tail with a fleshy keel; ventrals united to the belly by a membrane.

SERIOLA. Dorsal fins two, with an anterior procumbent spine.

Nomeus. Ventrals very large, united to the belly by a membrane.

Temnodon. First dorsal low; teeth numerous; fins scaly.

Seriola. Fusiform; first dorsal low; fins naked.

Psenes. Body oval, like a *Chætodon*; snout obtuse, truncate.

Platylepes. Mouth large, obliquely vertical; lateral line broad.

SIGANUS. Dorsal fin long, emarginate; ventrals with spinous and three soft rays.

Siganus. A single procumbent spine in front of the dorsal.

TRACHINUS. Pectoral fins large and falcated; lateral line generally carinated with imbricate scales; teeth distinct.

Trachinus. Body oblong, carinated plates along its whole length.

Charanx. Body thick, oval; plates on the tail only.

Zonichthys. Pectoral small, ventral large; lateral line hardly carinate.

Alepes. No scales; head small, rather pointed.

Micropteryx. Head small; scales moderate; lateral line smooth.

5. Sub-family **ZEINÆ**.—Body short, rhomboid, very thin; mouth protractile.

EQUULA. Ovate; mouth very protractile; dorsal fins one or two; back with a row of prickles.

Hamiltonia. Dorsal fins two; body diaphanous; gills serrated.

PLATYSOMUS. Body rhomboid, excessively thin; no visible teeth or scales.

Blepharis. Eyes very large; dorsal and anal attenuated; ventrals very long.

Argyriosus. Profile oblique ; two dorsal fins ; ventrals smaller.

Platysomus. Profile perpendicular ; ventrals minute ; one dorsal. ;

Hynnīs. Like the last, but the tail carinated.

Scyris. Slightly lengthened at the tail.

LAMPRIS. No scales ; dorsal and ventral opposite, and falcate.

Mene. Excessively thin ; ventral fin single.

APOLECTUS. Ventral fin nearly under the eye, long, and pointed ; snout truncate.

ZEUS. Scales distinct ; mouth very protractile ; the spined rays strong ; caudal fin round ; dorsal fins two.

Zeus. Sharp spines on the gill-covers, back, and belly ; eyes nearly vertical.

Capros. Scales rough, ciliated ; dorsal and anal spines very strong.

FAMILY 3. CORYPHÆNIDÆ.

Body thin ; dorsal fin single ; the rays long and mostly soft.

1. Sub-family CORYPHÆNINÆ. Body lengthened.

CORYPHÆNA. Ventral fins longer than the pectorals.

LAMPUGUS. Ventral fins equal to the pectorals.

CENTROLOPHUS. Vent central ; lateral line prominent.

2. Sub-family STROMATINÆ. — Body ovate, rhomboid ; ventrals often none.

SESARINUS. Ventral fin very minute.

STROMATEUS. Ventral fins none ; dorsal and anal falcate, scaly.

PEPRILUS. Eyes very large ; dorsal with small spines in front.

KURTUS. Dorsal fin short, central ; mouth large, sub-vertical.

KERIS. Rhomboid ; first ray of the dorsal, ventral, and anal fins serrated.

3. Sub-family TRICHIURINÆ. — Body linear, very long ; lower jaw lengthened and pointed ; ventral fin rudimentary or none ; no finlets.

TRICHIURUS. Caudal fin none ; tail ending in a point.

LEPIDOPUS. Caudal fin small, forked ; ventral rudimentary ; anal small.

AMMODYTES. Dorsal and anal fins fully developed ; teeth small.

4. Sub-family. ASTRODERMINÆ. — All the rays of the dorsal and anal fins simple.

ASTRODERMES. Body with scattered star-like scales.

5. Sub-family ACANTHURINÆ. — Body ovate, oblong; tail armed with lateral spines.

* Ventrals three-rayed.

AUXINURUS. Body oval, coriaceous; tail unarmed, with a single flat fixed plate.

PRIODON. Coriaceous; no spines on the tail.

NASETS. Front prolonged into a horizontal horn.

* * Ventrals five-rayed.

ACANTHURUS. Sides of the tail with a single moveable spine

Acanthurus. Caudal fin truncate; body scaly.

Teuthys. Caudal fin sub-forked; body coriaceous, without scales.

Ctenodon. Caudal large, lunated; body scaly; dorsal fin undivided.

Harpurus. Mouth contracted and produced, somewhat tubular.

Zebbrasoma. Mouth pointed; dorsal and ventral fins very broad.

PRIONURUS. Sides of the tail with two or more spines; body without scales.

Callidermes. Snout obtuse; caudal lunated; caudal spines two.

Aspisurus. Mouth contracted and somewhat tubular; caudal truncate.

Prionurus. Caudal spines immoveable.

TRIBE III. GYMNETRES. *Riband Fish*. — Body long, remarkably thin; dorsal fin extending the length of the back; ventrals large.

1. Sub-family PTERACLINÆ.

PTERACLES. Dorsal and anal fins excessively broad.

2. Sub-family GYMNETRINÆ. — Caudal fin horizontal, very small.

LOPHOTES. Ventrals minute; first dorsal ray horn-like.

GYMNETRUS. Ventrals long, oar-shaped.

XIPHICHTHYS. Excessively long; ventrals long, filiform.

NEMOTHERUS. No ventral or anal fins; caudal with a long filiform ray.

GYMNOGASTER. No ventrals; lateral line carinated and spinous.

3. Sub-family TRACHYPTERINÆ. — Caudal and ventral fins large.

CEPHALEPES. Dorsals two, the first with a long spatulate ray.

ARGYCTHIUS. Dorsal fin single; ventrals long, subulate, of three united rays.

TRACHYPTERUS. Caudal fin large, vertical.

CEPOLA. Body excessively long; caudal fin united to the dorsal and anal.

4. Sub-family OPHIDONINÆ.—Body anguilliform.

XIPHASIA. Body hyaline; snout obtuse; eyes very small.

OPHIDIUM. Body opaque; eyes very large; throat with cirri.

FIERASFER. Body semitransparent; no cirri.

5. Sub-family STYLOPHORINÆ.—Eyes pedunculated; snout cylindrical; mouth retractile, vertical.

STYLOPHORUS. Body linear, very long.

TRIBE IV. CANTHILEPTES.—Mailed cheeks; branchial aperture contracted; head armed with spines; scales small, rough, or prickly.

FAMILY 1. LEPIDOLEPRIDÆ.

Body anguilliform, mailed; snout prolonged; mouth placed beneath; dorsal fins two; tail pointed.

LEPIDOLEPRIS. Snout much lengthened; ventral fins long.

OXYCEPHUS. Snout not lengthened; ventrals small.

FAMILY 2. TRIGLIDÆ. *Gurnards.*

Cheeks mailed; scales hard, mostly spinous.

* with digitated processes.

TRIGLA.† Pectoral fins with free detached processes before the pectorals.

Peristidion. Body lengthened, slender, mailed with large plates.

Prionotus. Head and pectoral fins remarkably large; caudal truncate.

Ornichthys. Resembling the last; head smaller; caudal fin rounded.

DACTYLOPHORUS. Pectoral processes united; occiput with two long spines.

Dactylophorus. Head obtuse; pectorals as long as the body; caudal lunate.

Cephalocanthus. Pectoral fins rather small; caudal rounded.

† This and the remaining genera seem to represent sub-families.

** No digitated processes.

OPlichthys. Body very slender, mailed, spinous; head broad.

Rhynchichtys. Body ovate; upper jaw produced and pointed.

FAMILY 3. SCORPÆNIDÆ.

Scales smooth; pectoral fins very broad at the base, and extended towards the throat.

1. Sub-family SCORPÆNINÆ. — Body scaly; head compressed, spinous; mouth horizontal.

Pterois. Pectoral fins very large and long, the rays generally simple and digitated.

* Pectoral rays cleft.

Macrochirus. Pectorals as long as the body; mouth sub-vertical.

Pterois. Pectorals one third the length of the body; mouth sub-vertical.

** Pectoral rays undivided.

Pteroleptus. Caudal fin very large and lanceolate.

Pteropterus. Dorsal fin very low; pectorals as in *Macrochirus*.

Dendrochirus. Pectorals short, undivided, the rays branched.

APISTES. Pectorals long, all the rays branched; palate toothed.

Pterichthys. Pectorals very long, with a detached ray; lower jaw bearded.

Apistes. Pectorals moderate, with a detached ray; front spined.

Platypterus. Head obtuse, truncate; dorsal very broad, entire.

Trichosomus. Dorsal fins two, the first triangular.

Gymnapistes. Body often naked; anal with three strong spiny rays.

SCORPÆNA. Head with spines, compressed; pectoral rays partly simple.

SEEASTES. Head and body covered with scales; no filaments; mouth sub-vertical.

TÆNIONOTUS. Dorsal fin very broad; head and front truncate; mouth large.

2. Sub-family SYNANCHINÆ. — Body without scales; mouth and eyes vertical.

AGRIOPUS. Dorsal fin very broad, entire; head high; muzzle and mouth small.

PELOR. Pectorals very long, with two detached rays.

SYNANCHIA. Shape hideous, deformed; all the pectorals branched.

Synanchia. Eyes very small, anal fin short; mouth vertical.

Bufoichthys. Mouth oblique; eyes large; anal fin long.

Trachicephalus. Dorsal fin emarginate in the middle; anal fin long.

TRICHODON. Dorsal fins two; preoperculum spined; eyes large; mouth sub-vertical.

3. Sub-family BLEPSINÆ. — Dorsal fin three-cleft; ventrals minute.

BLEPSIAS. Head compressed.

4. Sub-family TRACHININÆ. — Mouth and eyes vertical; body with compact scales.

URANOSCOPIUS. Body thick, cylindrical; no operculate spine.

Ichthyoscopus. Habit of Uranoscopus, but with only one dorsal fin.

TRACHINUS. Body compressed; dorsals two; spine on the operculum large.

5. Sub-family PLATYCEPHALINÆ. — Head broad; ventral fins large.

PLATYCEPHALUS. Head broad; ventrals behind the pectorals.

BEMBRAS. Head not depressed; ventrals before the pectorals.

FAMILY 4. COTTIDÆ.

Ventral fins very small, imperfect, of three, rarely of four rays; head broad, depressed, spined; body wholly or partially naked.

HEMITRIPTERUS. Dorsal fins three-cleft; ventrals small; head depressed.

COTTUS. Body entirely naked; dorsal fins two.

HEMILEPIDOTUS. Body with stripes of small scales.

ENOPHRYS. Body naked; spines few; ventral fins very long.

GYMNOCANTHUS. Nape of the head contracted; eyes with bony orbits.

FAMILY 5. AGONIDÆ.

Body long, slender, mailed with hexagonal plates; ventral fins small, of two rays.

ASPHEDOPHORUS. Shaped like Cottus; snout with two spines.

AGONUS. Body linear; no spines on the snout; mouth vertical.

HIPPOCEPHALUS. Irregularly oval; nape much contracted; dorsals two.

CANTHYRYNCHUS. Body linear; snout spined; dorsal single.

TRIBE IV. BLENNIDES. — Generation viviparous ; size small ; the anterior dorsal rays generally sub-spinous and flexible ; ventral fins imperfect, or unusually developed.

FAMILY 1. BLENNIDÆ.

Ventral fins of two thick rays ; head compressed.

1. Sub-family BLENNINÆ. — Dorsal fin with a few spinous and many soft rays.

BLENNIUS. Teeth long, equal, compact, firm, with a lateral canine tooth.

Blennius. Profile vertical ; dorsal fin high, emarginate ; eyes crested.

Pholis. Dorsal fin almost entire ; no membranaceous crests.

Chasmodes. Profile lengthened ; mouth large ; branchial aperture formed by a spiracle.

Blenitrachus. Lower jaw longest ; mouth obliquely vertical.

Omobranchus. Branchial orifice above the pectoral ; canines large.

SALARIS. Fine setaceous teeth, flexible at their roots, with or without canines.

Petroscirtes. Branchial orifice above the pectoral ; a single row of teeth.

Salaris. Profile vertical ; dorsal deeply cleft ; canine teeth strong.

Eripichthys. Dorsal entire, or slightly emarginate ; canine teeth wanting.

Rupiscartes. Anguilliform ; caudal free ; ventrals of four rays.

Cirripectes. Short ; profile vertical ; a series of filaments round the nape.

CHIROLOPHIS. Anguilliform ; caudal fin attached to the dorsal ; ventrals three-rayed.

CRISTICEPS. Profile vertical ; dorsal fins two, remote, the first like a crest.

MYXODES. Head elongated, pointed ; teeth as in *Blennius* ; no canines.

2. Sub-family CLININÆ. — Dorsal fin with many spinous but few soft rays.

TRIPTERIGION. Dorsal fins three ; head somewhat produced.

CLINETRACHUS. Dorsal fins two ; mouth obliquely vertical.

BLENNOPHIS. Anguilliform, long ; head crested ; ventrals rather large.

CLINUS. Ovate ; dorsal fin linear ; all the teeth velvety.

LABRISOMUS. Front teeth strong, conic.

3. Sub-family OPHISOMINÆ. — Anguilliform, compressed; ventrals of one ray.

OPHISOMUS.* Dorsal rays entirely spinous.

4. Sub-family CIRRIARBINÆ. — Lower jaw longer than the upper.

CIRRIARBUS. Head and mouth with numerous cirri.

5. Sub-family OPISTOGNATHINÆ. — Maxillaries large, greatly prolonged behind.

OPISTOGNATHUS. Head very obtuse; ventrals of three rays.

FAMILY 2. GOBIDÆ.

Ventral fins of many rays either united or distinct; head depressed.

1. Sub-family GOBIANÆ. — Ventral fins united.

GOBIUS. Dorsal fins two; caudal fin rounded.

Gobileptes. Caudal lanceolate; scales large.

OGNICHODES. Body lengthened; dorsal fin single; caudal rounded.

PSILOMUS. Body ribband-shaped; dorsal, caudal, and anal united.

SCARTELAOS. No scales; dorsals two; caudal large, lanceolate, distinct.

PERIOPTHALMUS. Covered with scales; pectorals pedunculated; ventral fins sometimes cleft.

2. Sub-family CALLIONYMINÆ — Head and body broad; ventrals very large, distinct, posterior to the pectorals.

CALLIONYMUS. Without scales; aperture spiraculated.

PLATYPTERUS. Scales large; branchial aperture wide.

TRICHONOTUS. Body lengthened; dorsal fin single, the two first rays bearing long setæ.

3. Sub-family ELEOTRINÆ. — Ventral fins distinct

ELEOTRIS. Ventral fins distinct at the base; resembles Gobius.

ASTEROPTERYX. The first dorsal, and the ventral fins very long.

* These three last genera appear to represent sub-families.

COMEPHORUS. Dorsal fins two; pectorals very long; ventrals wanting.

RUPPELIA. Dorsal fins two; ventrals united (?); head thick, cirrated; mouth vertical. †

FAMILY 3. BATRACHIDÆ.

Head broad, ciliated; ventrals two rayed; pectorals not pedunculated.

BATRACHUS. Body with minute scales; dorsal fins two.

AMPHICHTHYS. Body naked; dorsal fin single.

FAMILY 4. CHIRIDÆ.

Body perch-like, compressed, with several lateral lines.

CHIRUS. Pectorals broad at the base; ventrals of five rays.

FAMILY 5. ZOARCHIDÆ.

Anguilliform; all the rays soft; dorsal, caudal, and anal united.

ZOARCHUS. Ventral fins minute, nearly obsolete.

ANARRHICHAS. Teeth large and strong; ventrals wanting.

ORDER II. MALACOPTERYGES.

Dorsal fins supported by soft, articulated, and branched rays.

FAMILY 1. SALMONIDÆ.

Scales and fins naked, not covered with the common skin.

1. Sub-family CYPRINÆ. — Dorsal fin single.

* No teeth.

CYPRINUS. Lips fleshy, simple; anterior dorsal rays spined.

Cyprinus. Dorsal central, the anterior spines serrated; anal short; jaws equal.

Barbus. Dorsal central, spines serrated or smooth; mouth furnished with cirri.

Labiobarbus. Lips excessively thick, the lower one pendant, the upper with cirri.

Salmostoma. Jaws equal; mouth large; dorsal fin near the caudal.

† This singular type, now first named, is of the chironectiform structure. It seems a Goby in the disguise of *Uranoscopus*, and to be the representative of all such vertical-mouthed fishes. This and *Comephorus* appear to be types of sub-families.

CATASTOMUS. Lips fleshy, very thick, plaited, crenated, or tuberculated.

Labio. Upper lip thick, crenated, or tuberculated; lower thin; caudal acutely forked.

Catastomus. Both lips thick, plaited, the lower one dependent.

Chedrus. Lips tuberculated, equal; dorsal fin near the caudal.

LEUCISCUS. Dorsal between the ventral and anal fins, the anterior dorsal rays not spined.

Chela. Mouth small, vertical; dorsal near the caudal; ventrals long.

Esomus. Anal beneath the dorsal; cirri very long.

Leuciscus. Dorsal between the ventral and anal; no cirri.

Tinca. Dorsal beneath the ventral; lips rather fleshy; cirri small, or wanting.

Abramis. Anal fin lengthened.

Gonorrhynchus. Mouth beneath the snout; head and body scaly.

* * With strong teeth.

ERYTHRINUS. Mouth large; head depressed, bony, naked.

* * * Dorsal fin single, very long.

SUDIS. Head depressed, naked, corrugated; teeth large.

Clupisudis. Head and mouth smaller; teeth minute; gills nearly smooth.

2. Sub-family SALMONINÆ. *Salmon.* — Dorsal fins two †, the hinder adipose.

* Teeth on the tongue; gill membrane seven-rayed.

SALMO. Mouth cleft horizontally as far as, or behind the eye; teeth sharp.

Mallotus. Body linear, of nearly equal breadth; pectorals rounded.

Coregonus. Mouth small; teeth minute, or none.

Argentina. Body semi-transparent; jaw teeth none; snout depressed.

* * Mouth very large; muzzle obtuse.

LAURIDA. Teeth acute, unequal, moveable; ventral fins large.

Triurus. Caudal terminating in three points.

Harpadon. Teeth crooked and barbed; ventral fin under the pectoral.

Aulopus. Teeth small, equal; ventral fin beneath the first dorsal.

Cynodon. Mouth oblique; teeth large; unequal ventrals.

* * * Tongue smooth; gill membrane four to five rayed.

CHARACINUS. Mouth small, cleft obliquely, and sinuated; belly smooth.

Anodus. Resembling Characinus, but without teeth.

Curimatus. Mouth very small, not sinuated; teeth small.

Serrasalmo. Body short; first dorsal behind the ventral; belly serrated.

† Except in *Sternoptyx*.

Tetragonopterus. First dorsal beneath the ventral; belly smooth or serrated.

Gasteropelicus. Body short; belly prominent; mouth vertical.

Chalceus. Belly prominent; tail long; pectoral fins long; mouth as in *Piabucus*.

Piabucus. Fusiform; anal fin very long.

XIPHOSTOMA. Jaws pointed, lengthened; upper jaw longest, acuminate; anal fin short.

Hydrocyon. Jaws equal; anal fin long.

Mormyrychus. Snout lengthened, contracted; mouth terminal and vertical.

**** Mouth vertical; body short, broad.

STERNOPTYX. — Body broad, excessively thin; only one distinct dorsal fin.

3. Sub-family **CLUPINÆ**. *Herrings*. — Dorsal fin single, central; body carinated.

* Tail long; ventral united to the caudal fin.

OSTEOGLOSSUM. — Caudal and ventral united, the rays equal; dorsal posterior.

Notopterus. Dorsal fin nearly central; ventrals minute.

Trichosoma. Ventrals large; pectorals minute, with setiform appendages.

ELOPS. Belly not compressed; tongue toothed; dorsal and anal fins short.

Setipinna. Pectorals large, ending in a filament; anal very long.

Megalops. Body not compressed; dorsal ending in a filamentous ray.

Engraulis. Snout prominent; mouth beneath, cleft horizontally.

CLUPEA. Mouth without teeth, small; dorsal and ventral opposite.

Thyrssa. Jaws equal, toothed; mouth terminal, very large, subvertical.

Chateassus. Belly compressed, carinated; dorsal ending in a filament.

Platygaster. Ventral nearly obsolete; dorsal before the ventral.

Pristogaster. Lower jaw turned up; mouth vertical; no ventral fin.

** Dorsal fin nearest the caudal.

CHIROCENTRUS. Body without scales; teeth strong, conic.

Hyodon. Body with large scales, not carinated.

Odontognathus. Dorsal minute; anal very long and low.

CORICA. Anal fins two; body diaphanous; mouth vertical; no teeth; belly serrated; dorsal fin nearly central.

4. Sub-family **ESOCINÆ**. *Pikes*. — Dorsal fin single, placed close to the caudal.

EXOCETUS. Pectoral fins excessively long; body herring-shaped.

Exocetus. Mouth simple; without appendages.

Cypsilurus. Mouth furnished with barbels or cirri.

RAMPHISTOMA. Body linear, lengthened; the jaws very long and pointed.

Ramphistoma. Jaws nearly equal; no finlets.

Scombresox. Hinder rays of the dorsal and anal forming finlets.

Hemiramphus. Upper jaw excessively short.

Lepisosteus. Upper jaw longest, depressed; body mailed.

Litholepes. Snout lengthened; mouth beneath; body mailed.

ESOX. Body oblong; snout blunt, broad, and depressed.

Esox. Body scaly; mouth very large.

Galaxias. Scales obsolete; mouth small.

Alepocephalus. Scales large; mouth small; eyes very large.

LEPTODES. Body slender; head very large and obtuse; teeth enormously long.

Leptodes. Dorsal fin placed near the head; caudal forked.

Stomia. Dorsal fin near the caudal, which is rounded.

DIPLOPTERUS. Anal fins two; mouth protractile; ventrals long, pointed.

5. Sub-family **MORMYRINÆ**. — Branchial aperture resembling a spiracle; mouth remarkably small and vertical.

MORMYRIUS. Dorsal fin single, short; snout moderate.

Scrophicephalus. Dorsal fin single, very long; snout produced.

FAMILY 2. PLEURONECTIDÆ. *Flat-fish.*

Body flat; the eyes on one side only.

1. Sub-family **PLEURONECTINÆ**. — Body short, oval; mouth terminal.

PLEURONECTES. Body obtuse, oval; dorsal reaching to the eyes; teeth tessellated.

HIPPOGLOSSUS. Body more elongated, thicker.

PSETTA. Body rhomboid; dorsal fin reaching to the muzzle.

PLATOPHRYS. Ventral fins confounded with the anal; eyes remote.

2. Sub-family **SOLEANÆ**. — Body lengthened, oval, thick; mouth beneath to the muzzle.

SOLEA. Caudal fins distinct; pectorals two.

BRACHIRUS. Pectorals two; dorsal, caudal, and anal united.

MONOCHIRUS. Pectorals unequal, the under one obsolete.

ACHIRUS. Dorsal and ventral fins distinct; no pectorals.

PLAGUSIA. Dorsal, caudal, and anal united; no pectorals.

FAMILY 3. GADIDÆ.

Body slimy; scales minute, covered by the skin; fins fleshy, all the rays soft; ventral fins very small.

1. Sub-family GADINÆ. — Dorsal fins three*; anal fins two.

GADUS. Dorsal fins three; lower jaw with cirri.

MERLANGUS. Dorsal fins three; cirri none.

CEPHUS. Head excessively large; caudal truncate.

LEPIDION. Dorsal fins two; anal fins united.

TILESA. Body lengthened; caudal truncate; dorsal equal.

2. Sub-family MERLUCCIUS. — Dorsal fins two; ventral fins with five distinct rays.

MERLUCCIUS. First dorsal triangular; caudal lunate; cirri none.

LOTA. Somewhat anguilliform; caudal rounded; lower jaw cirrated.

MOTELLA. First dorsal with slender rays; caudal rounded.

3. Sub-family PHYSINÆ. — Dorsal fins two; posterior ventral rays obsolete or wanting.

RANICEPS. Head very large; first dorsal as in Motella; ventral fins with the posterior rays obsolete.

PHYSIS. First dorsal triangular; ventrals of a single ray.

4. Sub-family BROSMINÆ. — Dorsal fins single.

BROSMIA. Ventral fins small; anal half as long as the dorsal.

5. Sub-family BROTULINÆ. — Dorsal, caudal, and anal fins united.

BROTULA. Mouth with distinct cirri or barbels.

PTERIDIUM. Cirri none; ventrals of a single ray.

FAMILY 4. SILURIDÆ.

Body without regular scales, but sometimes loricated; head depressed; the mouth furnished with cirri; the second dorsal fin, where present, adipose.

1. Sub-family LORICARINÆ. — Body mailed; head depressed†; the mouth beneath.

LORICARIA. Dorsal fin single.

HYPOSTOMA. Dorsal fins two.

* Except *Lepidion*.

† Except *Hoplisoma*.

HOPLISOMA. Head and body compressed; mouth terminal.

CATAPHRACTUS. Eyes very small, vertical; head very broad.

STURISOMA. Body long, slender; snout very long.

2. Sub-family **PIMELODINÆ**. — Body more or less naked; head compressed, moderate; the mouth terminal; dorsal fins two; anal fin short.*

SYNODONTIS. Head and body compressed; the latter short and broad; cirri pectinate.

MYSTUS. Sides of the body with spined bony plates.

PIMELODUS. Body naked; cirri simple; anal fin short.

BREVICEPS. Head short, depressed; anal fin rather lengthened.

CYCLOPIUM. Head depressed; eyes very small, vertical.

3. Sub-family **SILURINÆ**. — Tail and anal fin very long.

AGENIOSUS. Dorsal fins two; no cirri.

Silonia. Eyes very large; body compressed; carinated.

Ageniosus. Maxillaries resembling horns.

PACHYPTERUS. Dorsal fins two; cirri long.

Hypophthalmus. Eyes very distant.

Pachypterus. Ventral fins very long.

SILURUS *Linn.* Dorsal fin one, very short.

Clupisoma. Head compressed; eyes large.

Callichrus. Dorsal near the head; caudal forked.

Malapterurus. Dorsal near the tail; caudal forked.

Pusichthys. Dorsal fin placed near the head; tail lobed.

Silurus. Dorsal fin near the head; tail rounded.

PLOTOSUS. Dorsal, caudal, and anal fins nearly or quite united.

Clarias. Dorsal single; caudal fin distinct.

Plotosus. Dorsal single, united to the caudal and ventral.

Heterobranchus. Dorsal fins two, the hinder adipose.

CETOPSIS. Eyes very minute, vertical; cirri short.

4. Sub-family **ASPRELINÆ**. — Branchial opening very small; head and body depressed; opercula immoveable; eyes minute, vertical.

COTILEPHORUS. Belly with cup-shaped suckers.

PLATYSTACUS. Tail and anal fin very long.

ASPREDO. Anal fin short.

ASTROBLEPAS. Head naked; caudal fin truncate.

* Except in *Breviceps*.

5. Sub-family SORUBINÆ. — Body slender, naked; head large, long, depressed, the snout projecting; mouth beneath; dorsal fins two.

SORUBIUM. Second dorsal adipose, short.

PTERONOTUS. Second dorsal long, with numerous rays.

PHRACTOCEPHOTUS. Second dorsal short, the base only adipose.

FAMILY 5. COBITIDÆ.

Body lengthened, slimy; scales minute; mouth small, placed beneath; lips thick; teeth often wanting; ventral fins nearly medial; branchial aperture small. Generation viviparous.

1. Sub-family COBITINÆ. — Body lengthened; scales minute or none; teeth wanting; mouth with cirri.

COBITES. Body cylindrical; cheeks smooth.

Cobites. Body covered with scales; caudal fin truncate or rounded.

Acourus. Scales none; caudal fin generally lobed.

CANTHOPHRYS. Beneath the eye a moveable prickle.

Canthophrys. Proper; no scales; caudal fin rounded.

Diacanthus. Body oval, without scales; caudal fin forked.

Somileptus. Body lanceolate, very thin, with small scales.

2. Sub-family ANABLEPIDÆ. — Body oblong, the scales strong and compact.

ANABLEPS. Head depressed; eyes as if double; pectorals large and scaly.

3. Sub-family PÆCILINÆ. — Body oval, broad; scales large.

PÆCILIA. Jaws depressed, the lower longest; teeth small and slender.

Fundulus. Branchial rays four.

LEBIA. Teeth compressed, the tips crenated into three to four points; eyes large.

MOLINESIA. Dorsal fin very broad and long.

4. Sub-family BALITORINÆ. Head and body depressed; mouth small, transverse, placed beneath; cirri none; pectorals very large and rounded.

BALITORA. Scales large, tenacious; dorsal small, central.

ORDER III. CARTILAGINES.

Skeleton cartilaginous ; branchial apertures resembling slits in the skin ; head wide and flattened ; pectorals very large.

FAMILY 1. SQUALIDÆ. *Sharks*

Body pisciform ; all the fins distinct.

1. Sub-family SQUALINÆ. — No spiracles behind the eyes, or very minute ones in the aberrant genera.

SQUALUS. Teeth compressed, pointed, the sides serrated.

Squalus. Teeth serrated on each side ; tail rather short.

Alopias. Posterior dorsal adipose ; tail oblique, very long.

Serictius. Head with two horn-like appendages.

DALATIAS. No spiracles ; anal fin wanting ; dorsal fins two, armed with spines.

LAMNA. Spiracles sometimes minute ; caudal fin large, lunate ; mouth beneath.

Selachus. Teeth very small, narrow and conic ; muzzle short.

Isurus. No spiracles ; snout lengthened, acute ; tail keeled.

Lamna. Spiracles minute ; snout pyramidal ; tail keeled.

Alopecias.* Spiracles minute ; teeth simply triangular ; upper caudal lobe extremely long.

RHINEODON. Spiracles minute ; teeth very small, acute ; mouth terminal ; caudal lunate ; tail keeled.

2. Sub-family CENTRININÆ. — Spiracles behind the eyes ; dorsal fins sometimes spined.

CENTRINA. No anal fin ; dorsal fins two, armed with spines.

Spinax. Dorsal spines in front of the fins ; body smooth.

Etmopterus. Resembling *Spinax*, but with only three branchial apertures.

Centrina. Dorsal spines in the middle of the fins.

Centrophorus. Body armed with hard scales or prickles.

GALEUS. Dorsals two ; anal one ; tail unequal, oblique ; teeth as in *Squalus*.

Galeus. Spiracles rather large ; tail without a dimple.

Galeocerdo. Spiracles small ; a dimple at the base of the tail.

SCYLLIUM. Spiracles large ; caudal fin irregular, lobed, with the tip truncate.

Pristiurus. Snout lengthened ; base of the tail serrated with scales.

Chiloscyllium. Under lip broad, membranaceous ; upper nasal valve ciliated.

* The two sub-genera *Alopias* and *Alopecias* require investigation. Are they the same ? or do they represent each other ?

CESTRACION. Head not depressed; eyes vertical; mouth terminal; lips thick; dorsal fins spined.

MUSTELUS. All the teeth tessellated, as in the *Raidæ*.

3. Sub-family **ZYGANINÆ**.—Head excessively dilated; spiracles large.

ZYGANA. Head hammer-shaped.

Platysqualus. Head heart-shaped.

4. Sub-family **CROSSORHINÆ**.—Spiracles large; mouth terminal, with many cirri.

CROSSORHINUS. Dorsal fins placed near the tail.

5. Sub-family **PRISTINÆ**.—Muzzle sword-shaped, with spines.

PRISTIS. Teeth tessellated, covering the lips.

FAMILY 2. RAIDÆ. *Rays*

Head and body flat; the former more or less surrounded by the pectoral fins.

Sub-family **TRIGONINÆ**.—Tail armed with serrated spines.

TRIGON. Tail with a narrow linear fin either above or below.

PASTINACA. Tail attenuated, and without any fins.

PTEROPLATEA. Body broader than long; tail without fins.

RAIA. Body prickly; tail with small fins, but no spine.

ANACANTHUS. Resembling *Trigon*, but without a caudal spine.

Sub-family **PTEROCEPHALINÆ**.—Head detached from the fins, and prominent.

MYLIOBATES. Tail excessively long; head simple, without appendages.

RHINOPTERA. Muzzle divided into two lobes; mouth beneath.

CERATOPTERA. Two fin-like processes on the muzzle; mouth terminal.

ÆTOBATES. Lower jaw much longer than the upper.

PTEROCEPHALA. Muzzle with fin-like processes; mouth beneath.

Sub-family **TORPEDINÆ**.—Body and pectorals forming a disk.

TORPEDO. With two dorsal fins.

TEMERA. Dorsal fins wanting.

4. Sub-family SQUATINÆ. — Body shark-like ; head obtuse, detached ; mouth terminal.

SQUATINA. Head furnished with cirri.

5. Sub-family RHINOBATINÆ. — Body shark-like ; head pointed, mouth beneath.

RHINOBATES. Head pointed.

RHINA. Head obtuse.

FAMILY 3. PRIONIDÆ.

Branchial aperture as in osseous fishes.

PRIONODON. Muzzle forming a long lanceolate plate.

FAMILY 4. STURIONIDÆ.

Body covered with osseous plates and tubercles.

ACIPENSER. Jaws performing the office of teeth ; mouth cirrated.

FAMILY 5. CHIMÆRIDÆ.

Head with appendages ; tail ending in a point.

CHIMERA. Tail ending in a long filament.

CALLORHYNCHUS. Caudal fin narrow, placed on the sides of the pointed tail.

ORDER IV. PLECTOGNATHES.

Skeleton semi-cartilaginous ; branchial spiracle single.

FAMILY 1. BALISTIDÆ.

Body hard, mailed, tuberculated, or spined ; mouth very small.

1. Sub-family OSTRACINÆ. — Body mailed with angular plates.

OSTRACION. Body quadrangular, destitute of spines.

TETROSOMUS. Body quadrangular; spines on the back and belly.

* Body triangular.

Platycaanthus. Body with several flattened bony obtuse spines.

Lactophrys. Front and vent with two horn-like acute spines.

Rhinesomus. Body without spines, often scored as in the *Balistinæ*.

2. Sub-family **BALISTINÆ**.—Body granulated or reticulated; muzzle produced.

BALISTES. Body reticulated; sides of the tail armed with spines.

Balistes. The first dorsal spine smooth, acute; caudal rounded.

Rhinecanthus. First dorsal spine thick, rough, obtuse; caudal rounded.

Melichthys. Pelvis without rays; caudal fin doubly lunate.

Canthidermes. Body covered with prickles; caudal fin rounded.

CAPRISCUS. Body reticulated; sides of the tail without spines.

Capriscus. Caudal fin truncate or rounded; pelvis without rays.

Leiurus. Pelvis forming a large and distinctly rayed ventral fin; rays greatly lengthened; caudal small, doubly lunated.

Chalisomus. Caudal fin doubly lunated; pelvis with small rays; dorsal spine obtuse; dorsal and anal fins falcated.

Zenodon. Two longer pointed teeth in the upper jaw; tail singly lunated; pelvis without rays, nearly concealed; dorsal spine obtuse, truncate.

Pachynathus. Body short, compressed, triangular; head very large and long; eyes just above the pectoral fin; two front teeth in each jaw very long; dorsal and anal of equal breadth; caudal doubly lunate.

MONACANTHUS. The first dorsal fin represented by a single ray.

Alutera. Pelvis concealed beneath the skin; tail smooth.

Monacanthus. Body granulated; pelvis prominent; tail spined.

Cantherhines. Body granulated; pelvis prominent; tail smooth.

Chætoderma. Body covered with prickles; tail smooth.

Trichoderma. Body reticulated; sides of the tail with bristles and spines.

TRIACANTHUS. Ventral fins formed of two spines.

PSILOCEPHALUS. Body linear; head very long; mouth vertical, bearded.

3. Sub-family **TETRAODINÆ**.—Body oblong; prickly.

Tetraodon. Head short; body covered with prickles.

Leiodon. Head short; body entirely smooth.

Lagocephalus. Body above smooth; belly armed with spines.

Cirrhissomus. Sides of the body with cirriform appendages.

Canthigaster. Muzzle prolonged and narrow; belly with spines.

4. Sub-family **DIODONINÆ**.—No true teeth; body orbicular, armed with spines.

Triodon. Belly forming an enormous sack; body with short prickles.

Diodon. Margins of the jaws undivided; spines long.

5. Sub-family CEPHALINÆ.—Body oval or orbicular; the three hinder fins united.

Pedalion. Body oblong, truncate; jaws acuminate.

Orthogoriscus. Body nearly orbicular, granulated.

Molacanthus. Body armed with spines.

Cephalus. Body oblong; skin hard, with angular compartments.

FAMILY 2. CHIRONECTIDÆ.

Body compressed, naked, frog-like; eyes and mouth generally vertical.

CHIRONECTES. Body compressed, smooth; dorsal fin long, entire, or divided.

MALTHE. Body broad, depressed, armed with tubercles; tail compressed.

FAMILY 3. LOPHIDÆ.

Head enormous, nearly flat; pectorals pedunculated.

LOPHIUS. Mouth with numerous cirri; detached rays on the head.

FAMILY 4. SYNGNATHIDÆ.

Body mailed, angulated; snout tubular; mouth vertical.

SYNGNATHUS. Body linear, very long; dorsal fin single.

Syngnathus. With small pectoral and caudal fins; tail long.

Acus. Pectoral and caudal fins wanting; no sub-caudal pouch.

Solegnathus. With pectoral and anal fins, but no caudal; tail short.

HIPPOCAMPUS. Belly and crown deep.

Hippocampus. No ventral or caudal fins.

Solenostoma. Two dorsal fins; caudal fin large, pointed.

PEGASUS. Mouth placed beneath; body depressed; ventrals small.

ORDER V. APODES.

Body anguilliform; ventral fins wanting; branchial aperture spiraculated.

FAMILY 1. MURÆNIDÆ.

Body snake-like; scales none, or very small, enveloped in the skin; spiracles lateral, one on each side.

ANGUILLA. With pectoral fins.

Anguilla. Spiracle beneath the base of the pectoral; nostrils tubular.

Ariosoma. Spiracle before the base of the pectoral ; nostrils simple.

Ophisurus. Dorsal and anal fin extending to the tip of the tail.

Leptognathus. Jaws and teeth long, acuminate ; end of the tail naked.

Pterurus. Dorsal, anal, and caudal fins distinct.

MURÆNA. Pectoral fins obsolete, or none.

Nettastoma. Jaws greatly elongated ; spiracles two, transverse.

Pachiurus. Pectoral fins minute, obsolete ; tail very thick, obtuse.

Muræna. Pectorals none ; tail pointed ; spiracles on the sides of the head.

Dalophis. Spiracles two, placed on the sides of the throat ; no pectorals.

OPHIOGNATHUS. Dorsal and anal united ; no caudal ; pectorals very small.

ICHTHYOPHIS. Eyes distinct ; teeth acute ; no fins whatever.

ALABES. Spiracle single ; pectorals large ; a concave disk beneath.

FAMILY 2. SYNBRANCHIDÆ.

Spiracles placed under the throat.

SPHAGEBRANCHUS. Spiracles two, approximate ; upper jaw pointed.

MONOPTERUS. Spiracles two, united in a transverse cleft.

SYNBRANCHUS. Spiracle single ; dorsal, caudal, and anal fins united.

OPHICTHYS. Spiracle single ; body cylindrical ; no fins.

FAMILY 3. STERNARCHIDÆ.

GYMNOTUS. Body eel-shaped ; anal very long ; dorsal fin wanting.

GYMNARCHUS. Body scaly ; dorsal fin very long ; anal wanting.

CARAPUS. Body much compressed ; dorsal, caudal, and anal fins united.

STERNARCHUS. Operculum concealed ; body scaly ; anal fin distinct.

LEPTOCEPHALUS. Very thin, hyaline ; dorsal, anal, and caudal fins united.

FAMILY 4. PETROMYZONIDÆ.

Eyes small, or none ; mouth longitudinal.

AMPHIOXUS. Lanceolate, hyaline ; no pectoral, dorsal, anal, or caudal fins.

PETROMYZON. Body cylindrical ; spiracles seven on each side.

Petromyzon. Teeth in several rows.

Heptatremus. Teeth in two rows.

Ammocætes. Lower lip straight, and transverse ; teeth none.

MYXINE. Eyes none ; lips surrounded with cirri.

FAMILY 5. CYCLOPTERIDÆ.

Body ovate ; no scales ; adhesive disks on the belly.

LEPADOGASTER. Disks two ; caudal fin distinct.

Piecephalus. Disks two, with cup-shaped suckers.

Rupisuga. Disks two ; caudal united with the dorsal and anal.

GOBIESOX. Disk single ; caudal fin distinct.

CYCLOPTERUS. Body short, thick ; dorsal fin short.

LIPARIS. Body sub-anguilliform ; dorsal fin long.

CHAP. II.

A GENERAL ARRANGEMENT OF FISHES ACCORDING TO THEIR SUPPOSED NATURAL AFFINITIES AND RELATIONS.*

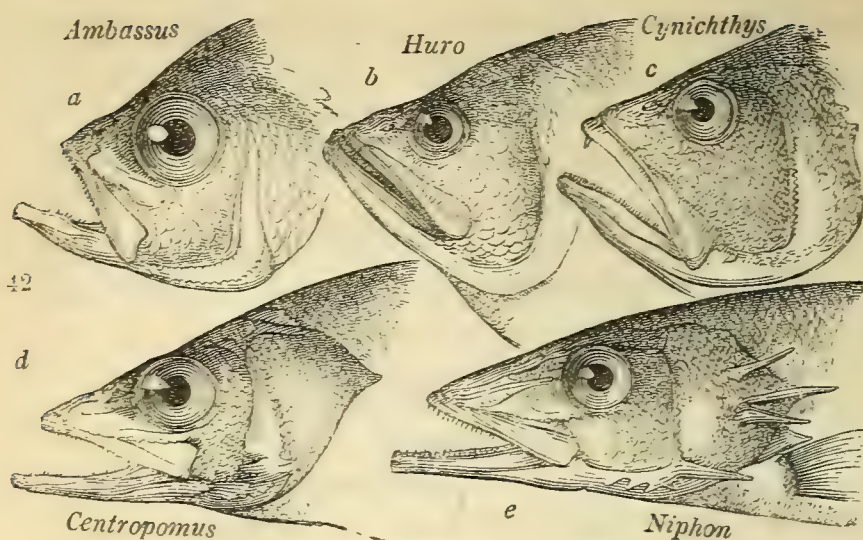
ORDER I. ACANTHOPTERYGES.

TRIBE I. MACROLEPTES.

FAMILY 1. PERCIDÆ. *Perches.*

Fins without scales ; body oblong ; scales distinct ; mouth large ; teeth in the jaws, vomer, and palate ; operculum spined ; preoperculum serrated ; ventral fins placed beneath, or slightly before, the pectorals.

* During the slow progress of this chapter through the press, several additions and improvements have been made, and sub-genera added or characterised, not to be found in the synopsis.



1. SUBFAM. PERCINÆ.

Dorsal fins two, distinct ; no canines.

PERCA Linn. Body oblong, fusiform ; jaws nearly equal ; mouth large.

Perca Linn. Gill covers more or less scaly ; caudal fin sub-lunate, lobate, or slightly forked ; body oblong, sub-fusiform ; mouth opening beneath the eye.

P. labrax Linn. Cuv. pl. 11. *acuta*. Cuv. pl. 10.
macronatus. Ib. pl. 12. *fluviatilis*.

Lates Cuv. General form of *Perca*, but the body is wider and the head narrower ; mouth large, extending behind the eye ; caudal and pectoral fins rounded ; preoperculum with strong teeth.

L. nobilis. Cuv. pl. 13.

Centropomus Cuv. (*fig. 42.d.*) Head pointed, as in *Lates* ; caudal fin large, forked ; the second spine of the anal fin remarkably large.

C. undecimalis. Cuv. pl. 14.

Nippon Cuv. (*fig. 42.e.*) Body fusiform ; first dorsal fin much larger than the second ; head lengthened, pointed ; very strong spines on the operculum, and a lengthened pointed one at the angle of the preoper-

cule, which is also toothed at its margin ; mouth large, horizontal, lower jaw longest ; caudal lobed, the lobes rounded. Analogous to *Holocanthus*.

N. spinosus. Cuv. pl. 19.

Lucioperca Cuv. General form of *Nippon*, but without any lengthened spines on the sides of the head ; dorsal fins equal ; caudal lobed or forked ; strong incisors, mixed with smaller ones, in the jaws, vomer, and palate ; cheeks more or less naked ; preopercule serrated.

L. Americana. Cuv. pl. 16.

Enoplosus Cuv. Body short, broad, compressed, oval, resembling the *Chætodons* ; mouth oblique ; dorsal fins two, distinct, but approximating.

Diplopteron Cuv. Head large, very high ; mouth oblique ; dorsal fins united at their base ; ventrals longer than the pectorals, and pointed ; caudal round ; scales small ; two series of dentations on the preoperculum.

D. bifasciatum. Cuv. pl. 21. Griff. pl. 57. fig. 2.

Gramistes Cuv. Body more oval ; head smaller ; scales very small, and covered with the common skin ; mouth oblique ; ventral fin small ; caudal fin rounded ; small spines on the preoperculum and operculum ; but the former is not crenated ; base of the hind dorsal, the anal, and the caudal with scaly sheaths.

G. orientalis. Cuv. pl. 27.

Enoplosus Cuv. General aspect of a *Chætodon* ; body broad, much compressed, nearly as high as it is long ; head suddenly narrowed, very small ; mouth small, oblique ; ventral as large as the pectoral ; caudal fin lunated ; dorsal and anal fins falcate ; preoperculum strongly toothed.

E. armatus. Cuv. pl. 20.

Aspro Cuv. Body lengthened, sub-fusiform, as in *Perca* ; dorsal fins remote ; mouth small, placed beneath the muzzle, which is obtuse, and projects over the under

jaw ; head depressed, broad ; caudal fin emarginate ; ventral rather larger than the pectoral.

A. vulgaris. Bloch, pl. 107. Cuv. pl. 26.

HURO Cuv. (*fig. 42. b.*) Preoperculum entire ; body fusiform, but broad in the middle ; head large ; mouth oblique, sub-vertical, large ; lower jaw longest ; chin projecting ; dorsal fins distinct, the first smallest ; caudal emarginate.

H. nigricans. Cuv. pl. 17.

APOGON. Eyes very large ; dorsal fins generally distinct ; mouth oblique ; caudal fin forked or lobed.

Ambassus * Cuv. (*fig. 42. a.*) Body ovate ; dorsal fins hardly united at their base, the first having a procumbent spine ; lower jaw longest ; preoperculum doubly crenated ; caudal fin large, forked.

A. Commersonii. Cuv. pl. 25.

Apogon Cuv. Head large, obtuse ; tail suddenly contracted and long ; dorsal fins quite distinct ; preoperculum doubly crenated ; caudal lobed.

A. trimaculatus. Cuv. pl. 22.

Pomatomus Risso. General aspect of the last, but the body more lengthened, and the head larger ; mouth nearly vertical ; eyes enormous ; dorsal fins small ; caudal very large, and forked teeth ; velvety scales large, deciduous ; preoperculum lobed, and only striated sides of the head scaled.

P. Telescopium. Risso. Cuv. pl. 24.

Cheilodipterus Cuv. Uniting the characters and aspect of *Apogon* and *Lucioperca*, having the eyes and fins of the former, and the more fusiform shape, sub-horizontal mouth, and large teeth of the latter ; body ovate, fusiform ; head rather pointed ; dorsal fins short and high ; caudal large, slightly forked ; mouth large, nearly horizontal.

C. Arabicus. Cuv. pl. 25.

* If this type enters in the genus *Apogon*, it must be that which represents *Huro*, or the chironectiform.

2. SUBFAM. SERRANINÆ.

Dorsal fin single, sometimes emarginate; branchial membrane with seven rays *; jaws with strong canines.

SERRANUS Cuv. Body ovate, fusiform; preopercule crenated; operculum with one or two isolated prickles; dorsal fin single, slightly emarginate in the middle, naked, and without scaly sheaths at the base.

Serranus Cuv. Caudal fin truncate or lunated; head rather pointed; mouth large, opening horizontally; lower jaw longest, pectoral ovate; teeth few, recurved, straggling, in two or more rows, those in the lower jaw longest; the vomer teeth smaller and crowded; body usually crossed by bands. Representing *Perca*.

S. scriba. Cuv. pl. 28. *cabrilla*. Cuv. pl. 29.
phænistomus Sw. Rüpp. pl. 26. f. 2.

Cromileptes Sw. Caudal fin rounded or oval; hinder part of the dorsal fin broader than the anterior; a strong canine tooth on each side of the lower jaw; body usually covered with spots. Representing *Lates*.

C. altivelis. Sw. Cuv. pl. 35. *myriaster*. Rüpp. (nec. *gigas*. Ib. pl. 33. *Cuv.*), i. pl. 27. f. 1.
miniatus. Rüpp. i. pl. 26. *fuscoguttatus*. Ib. f. 3.
f. 3. *hemistictos*. Ib. f. 3.

Plectropoma Cuv. General structure of *Serranus*; but the body is shorter and broader, and the anal spines very strong; caudal fin forked or lunate; the spines on the horizontal or lower edge of the preopercule are largest, and are directed forward; body banded. Representing *Centropomus*.

P. puella. Cuv. pl. 37.†

Cynichthys Sw.‡ (fig. 42.c.) Body shorter and broader;

* This is Cuvier's character; but it seems to be a variable one, for I find, on reference to my Sicilian MSS., that in the first, or typical species, *S. scriba*, I counted only six rays, while in *S. cabrilla* there were seven.

† *P. leopardinus*, Cuv. pl. 36., seems to connect this sub-genus with *Cromileptes*.

‡ This most beautiful fish is obviously the chironectiform type of the present group.

head large ; mouth very wide and large, obliquely vertical ; lower jaw with numerous teeth, all of the same length. Representing Huro. (See *fig. 42. b, c.*)

C. flavo-purpuratus. Frey. Atl. pl. 57. f. 2. Bennet, Ceyl. Fishes, pl. 19. (*fig. 42. c.*)

Variola Sw. Ovate, fusiform, the hinder part of the dorsal and anal fins considerably lengthened and pointed ; caudal, large, long, and deeply lunate, the upper and under extremities forming long points ; ventrals pointed. Representing Cheilodipterus.

V. longipinna Sw. Rüpp. i. pl. 26. f. 2. (*S. louti* Rüpp. *)

ETELES. Caudal fin large, deeply forked ; pectoral fins pointed ; dorsal fin almost divided into two ; eyes excessively large. Representing Apogon.

Elastoma Sw. Body fusiform ; spinal division of the dorsal longer than the hinder portion ; mouth and teeth as in *Serranus* ; eyes very large ; caudal deeply forked.

E. oculatus Sw. Cuv. pl. 32.

Uriphæton Sw. Ovate-fusiform ; dorsal fin only slightly emarginate ; mouth large, sub-vertical, with strong incisors at the tip of each jaw ; caudal forked, the two middle rays united into a filament as long as the body.

U. microleptes Sw. (*Serranus phæton*. Cuv. pl. 34.)

Eteles Cuv. General shape and habit of the last, and with similar dorsal fins ; several large incurved teeth in the jaws, but none in the palate ; caudal fin deeply forked, the upper extremity elongated into a filament.

E. carbunculus. Cuv. pl. 18.

GRYSTES Cuv. Dorsal fin almost divided into two, the anterior or spinous division shortest, the posterior lobed ; preoperculum smooth ; mouth large, sub-vertical ; lower jaw largest ; caudal emarginate ; sides

* Connected to *Serranus*, with which the circle of this genus began by *Serranus phænistomus*, which unites the truncate caudal of *Serranus* with the broad fins of *Variola*.

of the head scaled ; pectoral and ventrals small ; anal fin shorter than the hind part of the dorsal. Representing *Huro* in the circle of *Percinæ*.

G. Salmoides. Cuv. pl. 45.

ACERINA Cuv. Dorsal fin emarginate towards the caudal ; head naked ; preoperculum not crenated, but with obsolete spines, as in the operculum ; crown depressed, and marked with indentations ; mouth small, placed beneath the muzzle, which projects beyond the lower jaw ; ventral fin large ; caudal emarginate. Representing *Aspro*.

A. vulgaris. Cuv. pl. 41.

PENTACEROS. Body short, broad, compressed, resembling the *Chætodons* ; mouth oblique ; dorsal fin single, emarginate towards the caudal ; scales small ; orbits elevated over the eyes. Representing *Enoplosus*.

Polyprion Cuv. Body oblong-oval ; a ridged and spined process over the orbits and other short spines on the preoperculum and gill-covers ; ventral spine serrated, the fin rounded, and as large as the pectoral ; the hind part of the dorsal, the anal, and the caudal fins half covered with small scales ; caudal truncate.

P. cernium. Cuv. pl. 42.

Pentaceros Cuv. Body short, angular ; the belly flattened ; the sides much compressed ; dorsal slightly emarginate ; the spiny ray and that of the ventral very strong and lengthened ; caudal small, round ; mouth very small ; preopercule crenated ; over the eyes a horn-like protuberance.

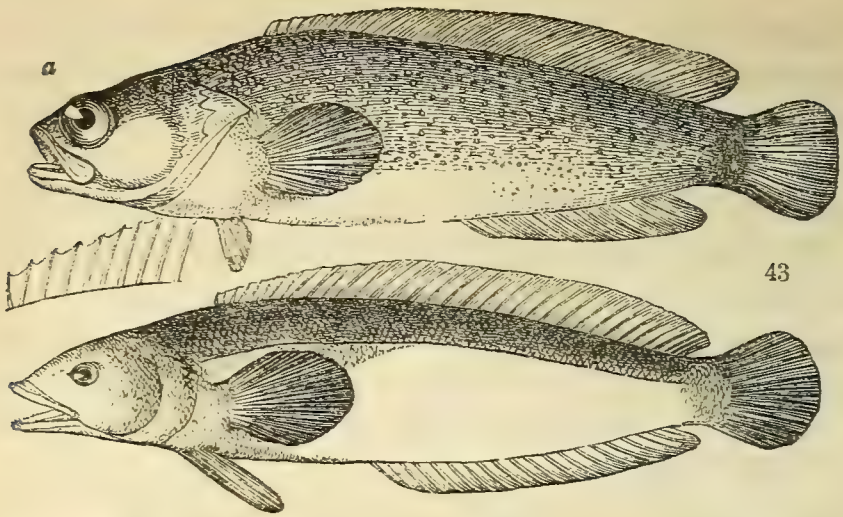
P. capensis. Cuv. pl. 43.

3. SUBFAM. PERCOPHINÆ.

Ventral fins placed before the pectoral ; dorsal fin single, entire* ; the spinal rays weaker and shorter than the others, and generally very few.

PINGUIPES. Body lengthened ; dorsal fins single, long, and narrow, with nearly all the rays soft.

* Except in *Percophis*.



Pinguipes Cuv. (fig. 43. b.) Body very fusiform, resembling that of a *Labrus*; scales small; head naked in front; lips fleshy; anal fin long, narrow, resembling the hinder part of the dorsal; pectoral and caudal rounded; ventral small, slender; no spines on the head.

P. Brazilianus. Cuv. pl. 63.

Percis Cuv. General form and fins of *Pinguipes*, but the head is thicker and more obtuse; one or two prickles on the operculum; the 304 spines on the dorsal are very short.

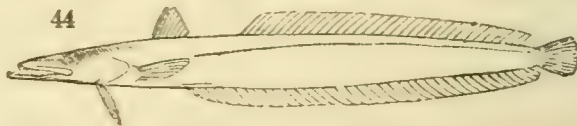
P. semifasciata. Cuv. pl. 62.

RYPTICUS * Cuv. (fig. 43. a.) Scales minute, covered as well as the fins by the common skin of the body; pectoral and caudal rounded; ventral very small; a few small prickles only on the gill-covers; mouth small; eyes very large; representing *Gramistes*.

R. arenatus. Cuv. pl. 46.

PERCOPHIS. (fig. 44.) Dorsal fins two; body anguilliform, cylindrical; tail very long.

Percophis Cuv. Body lengthened, slender; aspect resem-



bling *Sphyræna*; head long, pointed; mouth hori-

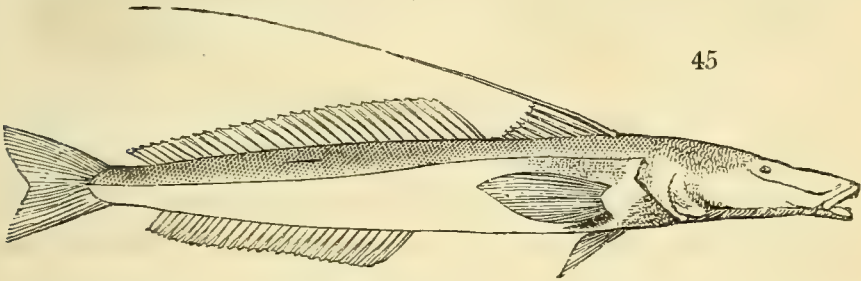
* This is clearly a representation of the *Gadidæ*; but I feel uncertain whether to consider it the type of a sub-genus, or of a genus.

zontal, large ; lower jaw much the longest ; the chin advancing and pointed ; a packet of long curved teeth at the tip of the upper jaw, and others scattered in the lower ; dorsals wide apart, the first triangular, the second long ; anal fin longer than the second dorsal ; head and body with small scales ; caudal rounded.

P. Brazilianus. Cuv. pl. 64.

SILAGO Cuv. (*fig. 45.*) Head lengthened ; mouth small ;

45



eyes minute ; first dorsal fin on a line with the pectoral and the ventral, having the first ray very long.

S. domina. Cuv. pl. 69.

CENTROPRISTIS Cuv. Body ovate, compressed, sub-fusiform, but rather broad ; dorsal fins emarginate ; head rather large ; preopercule dentated ; operculum spined ; caudal fin doubly lunate ; ventral fin smaller, and slightly before the pectoral.

C. nigricans. Cuv. pl. 44.

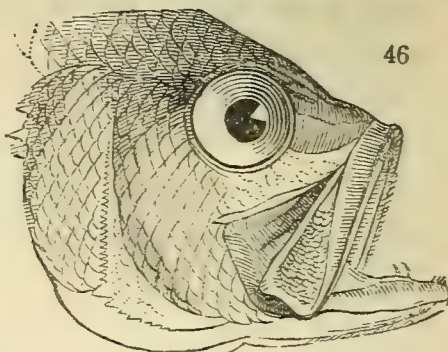
PRIACANTHUS Cuv. Body ovate, compressed, obtuse ; head large ; mouth large, obliquely vertical ; lower jaw longest ; the chin pointed and advanced ; eyes enormous ; ventral fins very large, the last ray attached to the belly by a membrane ; pectoral very small ; caudal truncate ; the whole head and body covered with small rough scales ; angle of the preopercule with an obtuse spine, the margin crenated. Representing *Huro* and the *Holocentrinæ*.

P. Japonicus. Cuv. pl. 50.

4. SUBFAM. HOLOCENTRINÆ.

Body covered with hard, rough, or denticulated scales, or mailed plates ; the head being very spiny, and the mouth often oblique ; dorsal emarginate.

ANTHIAS Antiq. (fig. 46.) Ventral fin exceeding long; caudal very lunate, and ending in filaments; body ovate; head obtuse; eyes large; mouth wide, sub-vertical, the lower jaw longest; each jaw with a single row of small and sharp teeth, those in the upper jaw being curved upwards; these are intermixed with larger ones in both jaws, curving different ways; vomer with numerous others, small and curved; lateral line abruptly bent near both extremities; jaws, head, and body covered with small rough scales; gill membrane six-rayed.



A. sacer. Bloch, pl. 315.*

HOLOCENTRUM. Dorsal fins; scales hard, imbricate, regular.

Holocentrum Artedi. Anal spines exceedingly strong; body ovate, fusiform; head and back arched; scales large, hard, and crenated; spines on the operculum and preopercule very long and sharp, the edges of all these bones being strongly toothed; sub-orbital plate crenated; dorsal fin cleft almost into two, with the spines and those of the anal very strong; caudal deeply lobed or forked; ventral fin of many rays; lower jaw longest.

H. hastatum. Cuv. pl. 59.

spinifer. Rüpp. ii. pl. 25. 1.

ruber. Ib. i. pl. 22. fig. 1.

diadema. Rüpp. i. pl. 22. 2.

samara. Ib. i. pl. 22. fig. 3.

ruber. Benn. Cey. pl. 4.

Corniger Spix. Anal spines small, those of the sub-orbital bone excessively large; pectoral fin rounded;

* If the figure at pl. 31. (where this fish is unaccountably placed with *Serranus*), in Cuvier and Valenciennes's work, is correct, it must be a different species to the *A. sacer* of Sicily; it represents the lower part of the operculum and sub-operculum as crenated similar to the edge of the preoperculum, and the superior teeth as not bent upwards. In the Sicilian species (of which specimens are fortunately in the Zoological Museum) there are no serratures on the operculum or sub-operculum, and the ventral fin is pointed, not rounded. I can hardly think that these important differences originate in error, because such carelessness would throw a doubt on the general correctness of those otherwise well-executed plates.

caudal truncate ; scales with their margins strongly toothed ; teeth rather strong, sharp, even.

C. spinosus. Spix and Agass. pl. 75.

Myripristis Cuv. No prominent spine on the preopercule, and only one or two small ones on the operculum ; eyes excessively large ; scales as in *Corniger* ; both profiles of the head and body equally curved ; mouth sub-vertical ; lower jaw longest ; caudal fin forked.

M. Japonicus. Cuv. pl. 58. *melanophrys* Sw.* Rüpp. i. pl. 23. fig. 2.

BERYX Cuv. Dorsal fin single, placed in the middle of the back, the rays of all the fins slender ; caudal very large and forked ; ventral fins nearly equal to the pectorals, and often of ten rays ; operculum and preoperculum crenated, but the spines very small or wanting.

B. lineatus. Cuv. pl. 60.

Hoplostethus Cuv. General shape of *Trachichthys*, but the head is marked by numerous bony ridges instead of spines, and the scales are smaller and more regular, as in ordinary fishes ; dorsal fin single, low, with six spinal rays, followed by others which are branched ; caudal fin divided to the base into two oval lobes ; pectoral large, oval ; head without scales ; interoperculum with a short spine ; belly serrated ; lateral line smooth ; mouth vertical ; lower jaw longest ; eyes very large.

H. Mediterraneus. Cuv. and Val. pl. 97. bis.

TRACHICHTHYS. Body short, oval, covered with excessively hard irregular plates instead of imbricate scales ; head large, obtuse ; mouth very wide, almost vertical ; the lower jaw longest.

Trachichthys Shaw. Body mailed with large rough plates, which form a spined ridge on the belly and lateral line ; operculum and nape of the head with

* *M. Murdjan Rüpp.*

other large spines ; eyes excessively large ; mouth completely vertical ; teeth none.

T. Australis Sh. Nat. Miss. pl. 378.

Monocentrus Cuv. Body entirely mailed with large angular plates, which are rough and carinated ; dorsal fins two, the first of a few very thick spines ; one large spine shows the ventrals, in the angle of which are the true fins, composed of soft and almost imperceptible rays.

M. Japonica. Sch. pl. 24. Cuv. pl. 97.

ORIOSOMA, Cuv. Body short, thick, oval, armed with conical horny tubercles of different sizes, two of which represent the first dorsal ; all the other fins with soft rays ; body granulated ; belly protuberant ; mouth small, vertical.

O. coniferum. Cuv. pl. 99.

5. SUBFAM. HELOTINÆ.

Dorsal fin one, deeply cleft ; branchial membrane of six rays ; jaw-teeth numerous, small, close set, and of equal size ; head and muzzle naked ; dorsal, and often the anal fins sheathed at their base with scales ; swimming bladder two-lobed, or contracted in the middle ; pectorals pointed ; strong spines in the middle of the operculum. Analogous to the Sparinæ.

THERAPON Cuv. Spine on the opercle very strong ; preopercle with pectinated teeth ; outer range of the teeth strongest ; ventral behind the pectoral ; caudal forked ; lower jaw slightly longest (?). Connecting this sub-family with the Holocentrinæ.

T. Theraps. Cuv. Val. 53.

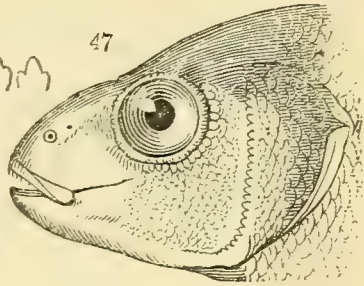
DATNIA Cuv. Body broad ; head and muzzle contracted and rather pointed ; dorsal and anal fins sheathed before, and scaled behind ; lower jaw shortest ; dorsal and anal spines remarkably large ; head scaly ; preopercle toothed ; opercle with two small prickles. Representing *Centropomus* and *Gerres*.

D. argentea. Cuv. pl. 54.

Pelates Cuv. Somewhat resembling *Datnia*, but the body is more lengthened, and the base of the fins are not scaly; all the teeth even; opercule spines small; preopercule crenated; caudal lunate; dorsal and anal spines moderate; fore part of the head and crown naked.

P. quadrilineatus *P.* Cuv. 55.

Helotes Cuv. (fig. 47.) Body fusiform; snout obtuse; mouth very small; outer teeth trilobate; preopercule crenated; opercule with small prickles; caudal lunate: representing Boops.



Helotes sex-lineatus. Cuv. Val. 56.

DULES. Operculum spines small; all the teeth simple and equal; eyes very large; pectoral small; ventral larger than the pectoral, and placed beneath it; caudal large, deeply forked; branchial membrane six-rayed; dorsal fin deeply emarginate in the middle: representing *Apogon*?

marginatus. Cuv. Val. 52. *rupestris.* Griff. Cuv. 7. 2.

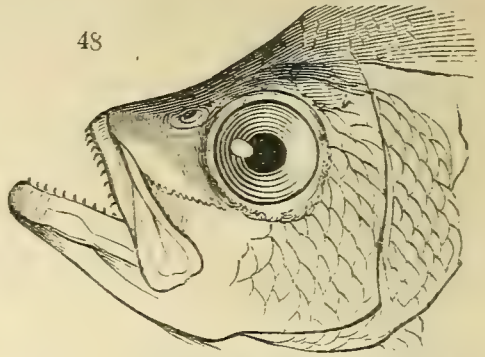
CIRRHITES *Commerson.* Body short, broad, resembling *Pomotis* in shape; mouth small; lower jaw shortest; several canine teeth mixed with the others; pectorals large, round; the lower rays simple, thick, lengthened, and partly free; ventrals behind the pectoral; anal and dorsal spines very strong.

C. fasciatus. Cuv. Val. pl. 47.

Pomotis Cuv. Body broadly oval, compressed; dorsal fin slightly emarginate, the hinder part and the anal with a sheath of scales at their base, the spines of these fins moderate; an elongated membrane or flap at the angle of the operculum; caudal fin lobed; ventrals under the pectoral, with a pointed basal scale.

P. vulgaris. Cuv. pl. 49.

CENTRARCHUS *Cuv.* (*fig. 48.*) Dorsal fin undivided, and, with the anal, having a number of short but graduated spines before the soft rays; mouth large, subvertical; the lower jaw longest; preopercule and gill covers smooth; teeth in the jaws and tongue close and even; ventral beneath the pectoral; caudal fin truncate: representing *Huro*, *Priacanthus*, &c.



C. sparoides. *Cuv.* pl. 46.

Genera of uncertain affinities. *

DIACOPE *Cuv.* Form and general aspect between a *Serranus* and a *Sparus*; body fusiform; head pointed; mouth large, horizontal; the under jaw generally rather the longest; pectoral fins invariably pointed; dorsal fin single, but emarginate, the spiny and the soft rays about equal; caudal fin more or less lunated or lobed; ventrals beneath the pectoral; teeth of the jaws as in *Serranus*; preopercule crenated, and with a notch which receives a tubercle on the interoperculum.

<i>revulina.</i> <i>Cuv.</i> pl. 38.	<i>coccinea.</i> <i>Rüpp.</i> ii. pl. 23. 2.
<i>lineolata.</i> <i>Rüpp.</i> i. pl. 19. 3.	<i>erythrina.</i> <i>Ib.</i> fig. 3.
<i>argentina-maculata.</i> <i>Ib.</i> fig. 1.	<i>nigra.</i> <i>Ib.</i> ii. pl. 24. fig. 1.
<i>fulviflamma.</i> <i>Ib.</i> fig. 2.	<i>annularis.</i> <i>Ib.</i> fig. 2.
<i>melanura.</i> <i>Ib.</i> ii. pl. 23. 1.	<i>cæruleolineata.</i> <i>Ib.</i> fig. 3.

Mesoprion *Cuv.* General structure of *Diacope*, but the operculum terminates in a blunt angle, and is not spinous; preopercule lobed and crenated.

uninotatus. *Cuv.* pl. 39. *chrysurus.* *Ib.* pl. 40.

* Some of these fishes I suspect are allied to *Serranus*, and others to the *Holocentrinæ*, while *Mesoprion* may possibly be referred to the *Sparinæ*. The whole, however, appear to require a perfect revision. It is remarkable that they have, in their pointed pectorals, one of the great natural characters of the *Sparinæ*.

FAMILY 2. CHÆTODONIDÆ.

Operculum without prickles; preopercle generally smooth; the spinal rays of the dorsal fewer than the flexible rays; dorsal fins generally united into one; scales and mouth small.

1. SUBFAM. CHÆTODONINÆ.

Body short, broad, much compressed; dorsal, anal, and caudal fins thickly covered with minute scales*; teeth setaceous, very slender, rather long, crowded; mouth remarkably small; dorsal fin generally single; pectoral pointed, sometimes emarginate.

CHÆTODON Linn. Body oval, broad; mouth more or less pointed; no spine on the preoperculum, or prickles before the dorsal; caudal truncate; pectoral fins small or moderate; dorsal fin single.

Rabdophorus Sw. Dorsal fin single, but with the first soft rays falcate, and lengthened into a filament; mouth porrect, and the lower jaw longest: representing *Pomacanthus*.

Ephippium Sw. Cuv. pl. 174.

Chætodon Linn. Dorsal single, emarginate, and rounded behind; all the rays graduated: representing *Holocanthus*.

reticulatus. Cuv. pl. 171.

Heniochus Cuv. An emarginate division between the spinal and the soft rays of the dorsal; the fourth ray more or less prolonged; crown with horn-like appendages; ventral fins very large, rounded, equal or longer than the pectorals.

monoceros. Cuv. pl. 176. *taurichthys* Sw. Cuv. pl. 181.

Chelmon Cuv. Mouth prolonged into a slender snout or tube; dorsal spines long, connected only at their

* Except in *Scatophagus*, which seems to unite this genus with *Gerres*.

base ; pectorals long, pointed ; ventrals moderate : representing *Zanclus*.

C. longirostris. Cuv. pl. 175.

HOLOCANTHUS Cuv., Lac. General structure of *Chætodon* ; fins covered with scales ; preoperculum armed with a strong spine at its lower angle.

Holocanthus Lac. Dorsal fin entire, emarginate ; caudal round ; pectoral and ventral pointed.

H. trimaculatus. Cuv. pl. 182.

Pomacanthus, Lac. Caudal fin rounded ; margin of the preopercule without serratures ; spine on the lower extremity smaller than in the last ; dorsal and anal fins emarginate, but with the two or three first soft rays prolonged into a filament in the typical species.

P. cingulatus. Cuv. pl. 185.

Genicanthus Sw. Body more elongated than in the two preceding ; caudal fin large, deeply lunated, the ends extended into filaments ; dorsal and anal fins entire ; ventral fin pointed, as large as the pectorals ; operculum spined as in *Holocanthus*.

Lamarekii. Cuv. pl. 184. tricolor. Bloch, pl. 426.

Zanclus Cuv. Body higher than broad ; scales very minute, and hardly discernible ; dorsal fin falcated, the anterior rays surmounted by excessively long filaments ; jaws produced into a short cylinder ; caudal fin lunate ; before the eye a prominent spine ; pectoral small ; anal pointed, moderate : representing *Chelmon*.

Z. cornutus. Cuv. pl. 177.

Monodactylus Lac. Body diamond-shaped, broader than long ; dorsal and anal equal, falcate ; ventrals of two spiny rays, the others obsolete ; pectoral small ; caudal slightly lunate.

Mon. falciformis. Lacepede, ii. p. 131. Cuv. pl. 18.
rhombeus. Griff. Cuv. pl. 55. fig. 2.

EPHIPPIUS. General structure and form of *Chætodon* * ; but the single or double dorsal fin has scales only at the base of the rays, and there are several short spines in front, placed close together.

Platax Cuv. General form of *Monodactylus* ; but the dorsal and anal are much more falcated, and the ventral fins often excessively long and pointed ; before the setaceous teeth is a row of others, larger, and tricuspidate ; pectorals small ; caudal truncate.

Gaimardi. Griff. Cuv. pl. 55. fig. 1.

Ephippus Cuv. Teeth as in *Chætodon* ; superior profile much more arched than the inferior ; profile obtuse ; front of the head gibbous ; dorsal fins two, the first naked ; pectorals small, not larger than the ventrals ; caudal truncate ; obsolete spines, sometimes pointing forward, at the base of the first dorsal.

gigas. Cuv. vii. 121. *Spixii* Sw. Spix pl. 61.†
orbis. Griff. Cuv. pl. 42. 1. *Goreensis*. Cuv. pl. 178.

Scatophagus Cuv. Dorsal fins two, united at their base, but without any concealed prickles in front, almost naked, or devoid of scales ; pectoral fins small, rounded ; ventral fins large, pointed ; caudal truncate.

S. ornatus. Cuv. pl. 180.

Drepane Cuv. Pectoral fins excessively long and falcate ; in other respects resembles *Scatophagus* ; but the dorsal fins have more scales ; caudal truncate.

punctata. Cuv. pl. 179.

Pimelepterus Lac. Body oval, more lengthened than in any of the preceding divisions ; head short, thick, obtuse, the muzzle truncate ; forehead gibbous ; mouth small, with a row of strong cutting teeth in front ; dorsal fins two, united at their extremities, with generally a procumbent spine in front ; anterior

* Excepting *Pimelepterus*, which leads to *Toxotes*.

† As this is totally different from the *Gigas* of Cuvier, I propose naming it after its eminent discoverer.

dorsal naked, the hinder and anal very scaly ; caudal lunate.

P. Boscii. Cuv. pl. 187. *P. capensis* Sw. Cuv. pl. 188.

Toxotes Cuv. Body oblong-ovate ; mouth large, opening almost vertically ; the under jaw longest ; fins scaly : the chironectiform type.

Brama Bloch. Form obovate, the anterior part of the head and body being broad, the hinder or tail much narrowed ; dorsal fin one, falcate, extending the whole length of the back ; caudal large, forked ; jaws and palate with slender curved teeth ; front gibbous.

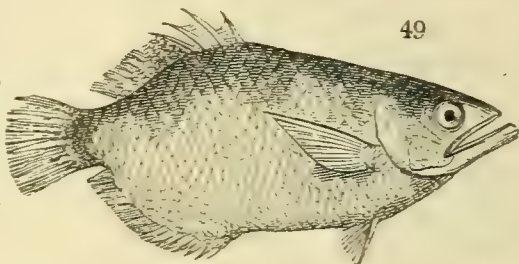
B. Raii. Griff. Cuv. pl. 31. fig. 1.

Pempheris Cuv. Head naked ; dorsal fin short, high, and placed over the pectoral ; eyes excessively large.

P. Mexicana, Griff. Cuv. pl. 31. fig. 2.

Toxotes Cuv. (*fig. 49.*)

Dorsal fin single, close to the caudal, with strong anterior spines ; caudal truncate.



49

T. jaculator. Griff. Cuv. pl. 31. fig. 3.

GERRES. Body oblong, fusiform ; habit that of *Sparus* ; mouth small, very protractile ; jaws with small and crowded teeth ; dorsal fin single, with a scaly sheath at its base, or half covered with minute scales ; three anterior rays of the anal formed of strong spines ; pectorals pointed ; caudal deeply forked.

Gerres Cuv. Back high and arched ; dorsal and anal spines very long and thick ; eyes large, close to the snout ; dorsal and anal with a scaly sheath at their base.

G. Plumieri. Cuv. pl. 167.

Cæcio Cuv. Body fusiform ; mouth rather larger ; dorsal and anal spines not much longer than the others,

but the base of these fins are thickly covered with small scales.

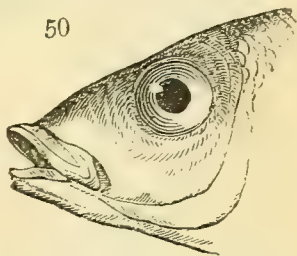
C. erythrogaster. Cuv. pl. 166.

Microcanthus Sw. Body intermediate in form between *Chætodon* and *Gerres*: dorsal fin slightly emarginate; the anterior or spinal half naked, but with a scaly sheath at the base; anal spinal rays very strong, naked; head very small, pointed; teeth as in *Chætodon*; preopercule serrated; caudal lunate; pectoral and ventral fins equal.

G. strigatus. Cuv. pl. 170.

*Mena** Cuv. (*fig. 50.*) Body fusiform, resembling a *Sparus*, and without any scales on the fins; mouth very protractile; teeth of the vomer very small, short, and crowded, placed on a narrow longitudinal band; those of the jaws extremely fine and also in a band; between the ventrals and on their sides are elongated scales.

50



vomirina. Cuv. pl. 164. *M. vulgaris.* Cuv.

Smaris Cuv. Differs only from *Mena* in having no teeth in the vomer.

S. chryselis. Cuv. pl. 165. *alcedo,* Griff. Cuv. pl. 49. fig. 1.

2. SUBFAM. SCÆNINÆ.

Fins partially scaled at their base; operculum armed with spines; the preoperculum serrated; teeth strong, but none either on the vomer or on the palate; snout more or less obtuse.

GLYPHISODON Cuv. General form of *Chætodon*, but the teeth are strong, cutting, emarginate or notched in the middle, and placed in a single row; gills quite smooth;

* I have, for the present, followed MM. Cuvier and Valenciennes in placing this and the following genera near to that of *Gerres*; but from the general want of scales on the fins, and other considerations, I have some suspicion that their natural situation will be among the true *Spari*, which *Gerres* obviously represents.

fins nearly covered with scales ; caudal large, forked ; mouth very small.

Pimelepterus Cuv. Body oval-oblong ; dorsal fins two, united at their base ; snout obtuse, short, truncate ; eyes large ; forehead rather gibbous ; teeth strong, cutting.

P. Boscii. Cuv. pl. 185. *capensis*. Ib. pl. 188.

Glyphisodon Cuv. Anal fin short ; vent medial ; body oval ; dorsal fin emarginate behind ; anal short, rounded ; caudal large, forked ; mouth small.

G. cœlestinus. Cuv. pl. 135. *insolatus* * *Sw.* Cuv. pl. 137.

Microgaster Sw. Anal fin long ; vent under the pectoral fin ; caudal lunate ; in other respects resembling *Glyphisodon*.

maculata. Cuv. pl. 136.

Chrysiptera Sw. Body ovate ; pectorals large, pointed ; eyes large, close to the muzzle, which is very short and obtuse ; dorsal fin long, emarginate at the end ; vent central ; anal short ; caudal fin round.

azurea. Frey. Atl. pl. 64. fig. 3. *Gamardii*. Ib. fig. 4.

Chætolabrus Sw.† General aspect of a *Chætodon*, but the lateral line is interrupted, as in *Labrus*, and there are numerous spines in the anal fin ; body oval ; pectoral and caudal fins rounded.

Suratensis. Bloch, 217. *maculatus*. Ib. 427.

PRISTOPOMA. Dorsal fin single, emarginate behind ; the preoperculum strongly serrated.

AMPHIPRION.‡ (*figs.* 51. 52.) Sub-orbital plates ; operculum and preoperculum serrated, and often spined.

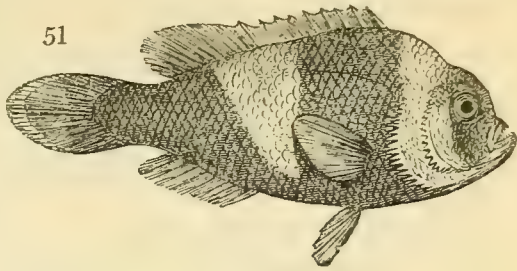
* *Heliases* Cuv.

† But, from the circumstance of M. Cuvier placing these fishes in the genus *Glyphisodon*, I should have concluded they were *Helostomæ*, and had labyrinthiform gills : the analogy is most complete.

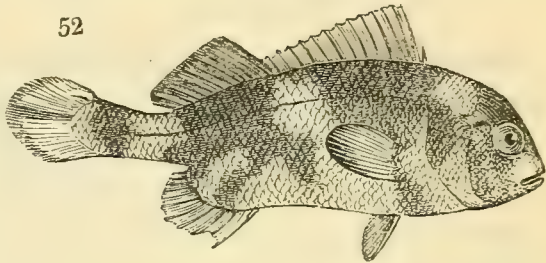
‡ Nothaving analysed this sub-family, I have thought it better to arrange the genera by characters easily distinguishable, as in the present instance, without venturing to determine their natural succession, or analogical representations. *Amphiprion* in its typical sub-genus, as well as *Lobotes*, appear *chironectiform* types, from their vertical mouth ; and perhaps the whole of these spine-cheeked genera correspond to the *Triglidæ*, &c.

Amphiprion Bloch. Obovate; the head and fore parts being broader and thicker than the posterior half; dorsal more or less emarginate; ventral fin nearly as large as the pectoral; the preoperculum and the three plates of the operculum very strongly and remarkably serrated at their edges, and grooved on their surface; the sub-orbital plates often spined; mouth subvertical.

51



52



* Caudal fin rounded.

A. punicatus. Lesson. Atl. laticlavis. Cuv. pl.132. fig.1. pl. 25. fig. 3.

** Caudal slightly lunated.

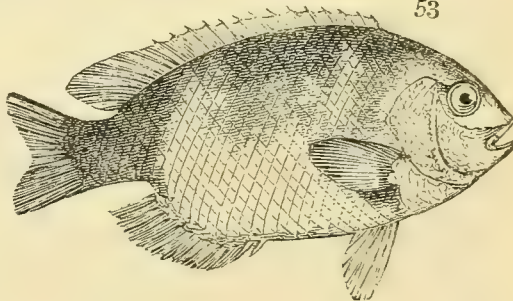
chrysogaster. Lesson. Atl. pl. 28. fig. 3.

Premnas Cuv. A very strong spine on the sub-orbital plate; in other respects resembling *Amphiprion*; caudal fin rounded; mouth small, horizontal.

P. semicinctus. Cuv. pl.133.

Pomacentrus Lac. (*fig. 53.*) Body oval; the profile of the head and the throat equally curved; mouth small; lips thick; eyes rather large, very near the snout; teeth cutting, emarginate in one or more rows; anal moderate; pectoral rounded; caudal slightly forked; the

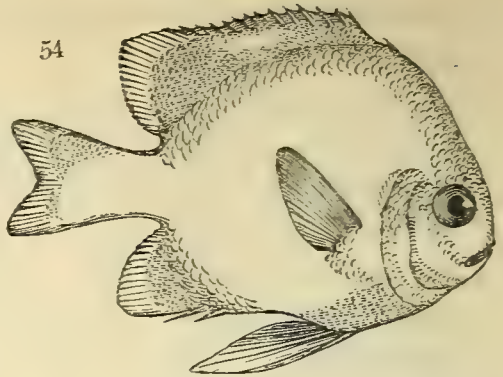
53



lobes rounded ; ventrals nearly as large as the pectorals.

fasciatus. Cuv. pl. 134.
marginatus. Rupp.
(fig. 54.)

emarginatus. Less. Atl.
pl. 28. fig. 1.
tæniops. Ib. fig. 2.



Scolopsides Cuv. Body oblong, fusiform ; sub-orbital plate turned backward, and finely serrated ; mouth small, retractile ; teeth small, even, and slightly incurved ; dorsal fin emarginate ; caudal forked ; eyes large ; operculum with an obtuse spine, but not crenated.

S. lycogenis. Cuv. pl. 127.

Cheilodactylus Cuv. Ovate, the upper profile more arched than the lower ; eyes placed high up towards the crown ; mouth small ; dorsal fin slightly emarginate in the middle ; the spines small ; jaws retractile ; caudal forked ; pectoral fins angulated ; one of the lower rays much longer than the others ; analogous to *Equula*.

C. zonatus. Cuv. pl. 129. *carponemus.* Cuv. pl. 128.

Plectorynchus Lac. Body ovate-oblong ; head generally thick, obtuse ; dorsal fin emarginate, the hinder portion and the anal, which is short, covered with scales at their base ; ventral fin about the size of the pectoral ; caudal either lengthened and greatly rounded, or lunated.

* Caudal lengthened, rounded. ** Caudal slightly lunated.

D. Orientale. Cuv. pl. 124. *Lessonii.* Less. Atl. pl. 24.

Pristopoma Cuv.* Ovate-oblong ; fins as in the last,

* M. Cuvier remarks, that this genus has " no scales on the dorsal and anal fins : " and yet, in the very species he figures as the type, these scales are as conspicuous as in *Diagramma*. Not having yet analysed these genera, I have for the present adopted most of these divisions of the *Scæninæ* ; but they all seem to require a complete revision, and their characters drawn out with greater accuracy and precision.

but the ventral is smaller, the caudal forked, and the anal spines remarkably strong ; operculum with a “ blunt angle ” at its posterior edge.

P. bilineatum. Cuv. pl. 122.

Hæmulion Cuv. Oblong, fusiform ; the mouth rather wide ; lower jaw compressed, having under its symphysis two pores, and a little oval dimple ; dorsal emarginate towards the caudal ; anal short, with scales at its base ; caudal forked.

H. quadrilineatum. Cuv. pl. 120.

Lobotes Cuv. Body ovate, thick, and broad, compressed ; eyes and head very small ; mouth opening obliquely ; the lower jaw longest ; pectoral and caudal fins rounded ; dorsal emarginate, with a sheath of scales ; the hinder portion, together with the anal and caudal, almost covered with minute scales ; preoperculum strongly serrated ; a chironectiform type.

somnolentus. Cuv. pl. 126.

Latilus Cuv. More lengthened ; head obtuse ; dorsal fin long, with only six slender spinal rays in front, the rest branched, and of equal length ; caudal lunate. Analogous to *Iulus*.

L. doleatus. Cuv. pl. 130.

SCIÆNA. Spinal rays of the anal fin very slender.

Sciæna Linn. Caudal fin rather elevated, truncate or lunated ; spines at the anal slender ; no canine teeth.

S. umbra. Auct.

Otolithus Cuv. Resembling *Sciæna* in its small anal spines ; but the head is more lengthened ; the mouth larger, the under jaw longest ; the foremost teeth long and hooked ; and the caudal considerably rounded.

elongatus Sw. Cuv. 103.

ruber. Cuv. pl. 102.

Ancylodon Cuv. Dorsal fins very remote ; head large, without scales, lower jaw longest ; canine teeth large, curved, extending on the sides of the under jaw ; caudal rounded.

A. parvipinnis. Cuv. pl. 105.

Nebris Cuv. Resembling *Lepipterus*, but the mouth is much larger ; eyes very small ; dorsal fins united, the second anal spine short and weak ; ventral fin smaller than the pectoral.

N. microps. Cuv. pl. 112.

Leiostomus Cuv. General form of *Umbrina* ; snout very truncate ; caudal fin slightly lunate ; pectoral and anal pointed ; ventral spine small ; head scaly ; no canines in front ; dorsals hardly united.

L. humeralis. Cuv. pl. 110.

Eques Bl. General form of *Umbrina* ; the caudal even more inclined upwards, but this fin is round ; dorsals two, separate, the first short, very high and falcate ; the second very long ; ventral as large as the pectoral ; anal very short, oval ; fins scaly at the base.

E. punctatus Bl. Cuv. pl. 116.

LEPIPTERUS. Anal fin short ; the second spine excessively strong ; head scaly.

Larimus Cuv. Body oval ; the under profile as much curved as the upper ; eyes large, placed close to the snout, which is not thick or truncated ; mouth large, opening obliquely ; and spine very strong ; caudal fin much rounded ; no canine teeth.

L. breviceps. Cuv. pl. 111.

Lepipterus Cuv. Body more slender and fusiform ; scales minute ; no canine teeth ; caudal rounded ; anal spine excessively strong ; ventrals large.

L. Francii. Cuv. pl. 103.

Corvina Cuv. Anal spine very strong ; ventral large, pointed, as long as the pectoral ; caudal rounded ; no canine teeth in front.

C. lobata. Cuv. pl. 107.

Umbrina. Cuv. Ventral profile nearly stright ; snout thick, obtuse, truncate ; mouth horizontal ; lower jaw shortest, with a single cirrus ; dorsals distinct ; caudal fin truncate or sub-lunate, and inclining upwards.

U. coroides. Cuv. pl. 117.

Pogonias Cuv. General form of *Umbrina* ; but the caudal is rounded, and there are many cirri on the lower jaw ; anal spine very strong ; ventral large and rounded.

P. fasciatus. Cuv. pl. 118.

Micropogon Cuv. Resembles the last ; but the second anal ray is only half as long as the next, and the ventral is small and pointed.

M. luniatus. Cuv. 119.

3. SUBFAM. SPARIANÆ.

Pectorals always pointed ; caudal forked ; fins naked ; no spines upon the operculum ; the preoperculum generally smooth ; teeth strong ; canines in the anterior row, and grinders on the sides.

CHRYSOPHRYS. Muzzle rather obtuse ; body broad ; ovate jaws, with conic or obtuse teeth in front, and strong grinders on the sides.

Chrysophrys Cuv. Body broad, ovate, attenuated at each end ; head moderate ; dorsal fin emarginate, naked.

aurata. Cuv. pl. 145.

Chrysoblephus Sw. Head very large, broader than the body ; the front obtuse, truncate ; the profile almost vertical ; eyes near the crown, which is elevated and gibbous ; lateral line terminating at the lower side of the tail.

C. gibbiceps. Cuv. pl. 147.

Pagrus Cuv. General shape and structure of *Chrysophrys* ; pectoral fins long ; front high, not gibbous ; the anterior teeth small and even, each jaw with two rows of molars on each side.

P. vulgaris. Cuv. pl. 148.

Argyrops Sw. Body shorter and broader ; anterior dorsal spines terminating in long filaments.

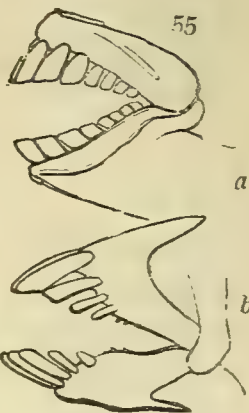
spinifer *Forsk.* Russ. pl. 101.

Calamus Sw. Form intermediate between *Chrysophrys* and *Chrysoblepus* ; head very large ; profile abruptly

oblique ; dorsal fin slightly emarginate in the middle ; the second anal spine hollow, and shaped as a pen ; pectorals large.

E. megacephalus Sw. Cuv. pl. 152.

SARGUS Cuv. (*fig. 55. a.*) Body broad, but the extremities attenuated ; head small ; fins as in *Chrysophrys* ; in front of the jaws a row of cutting teeth of similar shape to those in man, which are sometimes slightly notched in the middle ; sides with grinders.



S. rhomboides. Cuv. pl. 143.

Charax Cuv. (*fig. 55. b.*) General form and fins of *Sargus* ; but the jaws are a little produced ; the front teeth shaped like those of *Sargus*, are placed on the anterior extremities of the jaws, and point forwards ; those on the sides very minute.

C. fasciata Sw. Cuv. pl. 144.

PAGELLUS Cuv. Body more lengthened and fusiform than in *Pagrus* ; the head more pointed ; anterior canines crowded, conic, and slender ; pectorals rather lengthened.

P. erythrinus. Bl. pl. 274.

Lithognathus Sw. Body fusiform ; head lengthened ; mouth terminal, very small ; the maxillaries thick, enlarged, and as hard as stone ; caudal fin small, and slightly forked.

L. capensis. Sw. Cuv. pl. 151.

Boridia Cuv. Lengthened, fusiform ; dorsal fin divided into two, the first triangular ; pectoral and ventral fins equal ; caudal large, deeply lunate ; jaws with several rows of obtuse teeth.

B. grossidens. Cuv. pl. 114.

Lethrinus Cuv. General form of *Charax*, but the greater part of the head is devoid of scales ; the operculum and sub-operculum being alone scaly ;

large conic canines in front, minute ones behind, and a single row of grinders on the sides; dorsal fin emarginate; head large; muzzle rather produced; gills smooth; ventrals smaller than the pectorals.

esculentus. Cuv. pl. 158.

genivittatus. Ib. pl. 159.

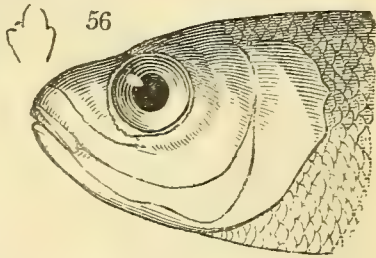
SPARUS. Head and gill-covers smooth; mouth small, slightly retractile; body fusiform; emarginate cutting or hooked teeth in each jaw, but no grinders.

Sparus.* (*fig. 56.*) Body more or less fusiform; dorsal fin very slightly emarginate.

Boops *L.* Cuv. pl. 161. (*fig. 56.*)

Salpa. Ib. pl. 162.

cantharus *Linn.* Cuv. pl. 160.



Dentex. General aspect of *Sparus*, but the mouth is larger; there are strong simply conic teeth in each jaw, the lower of which is the largest; dorsal fin slightly emarginate.

D. vulgaris. Bloch, pl. 268.

Nemipterus Sw. Jaws equal; dorsal fin broad, extending the whole length of the back, of equal rays, excepting the first, which is prolonged into a filament; caudal forked; another filament terminates the exterior upper ray; ventral fin long and pointed.

N. filamentosus. Cuv. pl. 155.

Oblata Cuv. General aspect of *Sparus*, but the mouth opens rather obliquely, and the lower jaw is longest.

O. melanura. Cuv. pl. 162. bis.

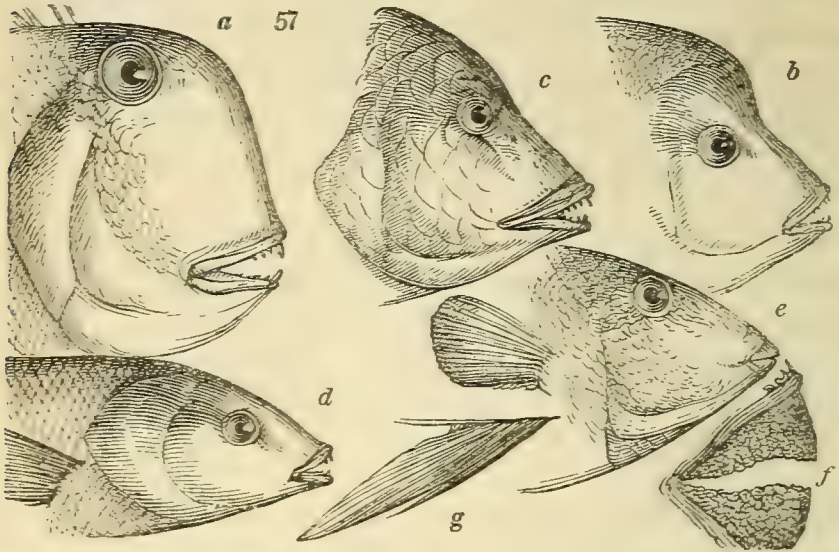
Asphareus Cuv. General form of *Sparus*, but the mouth is very large; the under jaw strong, and longer than the lower; dorsal entire; the last rays of the dorsal and of the anal prolonged into short filaments.

A. cærulescens. Cuv. pl. 162. bis.

* Including *Crenidens*, *Scathurus*, and *Cantharus*.

4. SUBFAM. SCARINÆ.

Head and crown rather elevated; jaws in the typical genera, performing the office of teeth; scales at the base of the caudal very large.



ZYRICHTHYS. Blenniform; forehead much elevated; teeth mostly as in the Labridæ; ventrals generally very long: representing the Dolphins and the Gymnetres, or ribbon-fish.

Zyrichthys, proper, Cuv. (fig. 57. a.) Head very large, high; eyes almost vertical; dorsal fin narrow, nearly of equal breadth, but pointed before; caudal rounded.

bimaculatus. Rüpp. i. 10. fig. 2.

altipinnis. Ib. ii. pl. 7. fig. 1.

Thalassoma Nob. (fig. 57. b.) General aspect of *Zyrichthys*, but the muzzle becomes suddenly more advanced, and the eyes are lower; ventrals longer than the pectorals.

T. purpurea Nob. Rüpp. Atl. pl. 6. fig. 3.

Urichthys Nob. (fig. 57. c.) Muzzle still more pointed than in the last; dorsal and anal fins dilated and pointed behind as in *Crenilabris*; pectorals rounded; ventrals (typically) very long and pointed; caudal enormous, truncate, the rays projecting beyond the membrane.

U. lunulatus Nob. Rüpp. Atl. 6. fig. 1.

quinque-cinctus. Ib. ii. pl. 5. fig. 1.

Malacanthus Cuv. Resembling in shape *Zyrichthys*, but the body is more elongated; spiny rays of the dorsal very few; tail lunate: the anguilliform type.

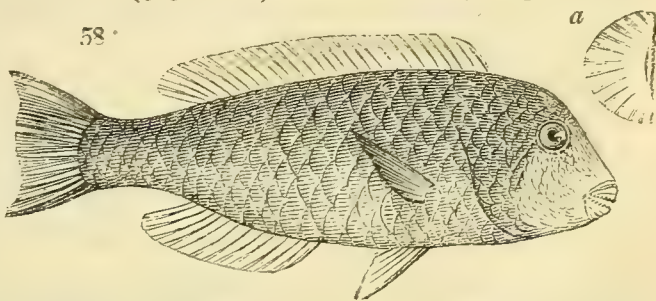
M. Plumierii. Lacep. iv. pl. 8. fig. 1.

Crassilabrus Sw. General form of *Urichthys*, but the mouth is oblique, and the lips excessively thick; eyes very small; ventral fins short, and scarcely pointed; dorsal and anal fins without any scales at their base; the simple rays slender and flexible; caudal fin small, rounded, the margin entire; forehead abruptly gibbous: the chironectiform type; representing *Lobates*, *Astronotus*, &c.

C. undulatus. Rüpp. Atl. pl. 6. fig. 2.

SCARUS Linn. Dorsal fin continuous, entirely composed of soft rays; body ovate, with the head gibbous or elevated; mouth small; jaws (*fig. 57. f*) large, bony, assuming the form and office of teeth, as in the *Plectognathes*, but the true teeth are very small, and arranged like scales or tubercles upon them; lips thick, fleshy, but single.

Scarus Antiq., Linn. (*fig. 58.*) Head large, gibbous; crown elevated; caudal lunate; pectoral fins pointed; lateral line continuous; scales with radiated grooves. (*a.*) European seas.



S. Cretensis. Bl. pl. 220.

Calliodon Cuv. Mouth obliquely vertical; profile obtuse; eyes very large, near the crown; belly prominent; mouth retractile, distinct, and separate; lateral teeth in the upper jaw with an inner range of smaller ones; pectoral and caudal rounded; all the fin rays soft; ventrals very small; lateral line branched: the chironectiform type.

C. spinidens. Quoy and Gaim. p. 289.

Leptoscarus Sw. Elongated, fusiform; head lengthened; muzzle obtuse; scales sub-triangular; pectorals small, rounded; caudal lunate.

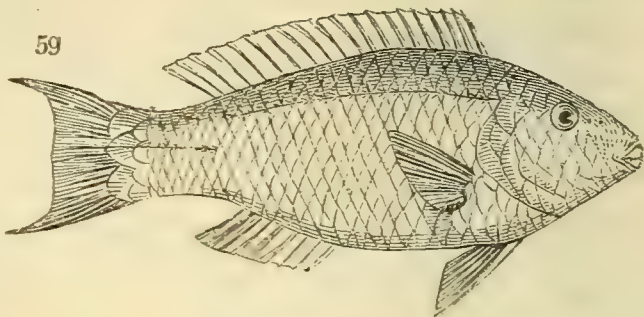
L. Vargiensis. Quoy and Gaim. p. 288.

Hemistoma Sw. Ovate; muzzle obtusely pointed; crown not elevated; caudal very large, doubly lunate; pectoral (*fig. 57. g*) and ventrals pointed.

H. reticulata Sw. (Scarus pepo. Benn. Ceylon. pl. 28.)

PETRONASON Sw. Ovate; the dorsal fin with simple or spiny, and branched or soft rays; head moderate.

Petronason Sw. (*fig. 59.*) Proper; muzzle obtusely pointed (*fig. 57. e*); crown not elevated; caudal fin more or less lunate, the extremities forming a lengthened point; pectorals pointed; lateral line interrupted; the simple and branched dorsal rays nearly equal in number.



P. psittacus. Rüpp. pl. 20. 1.

Rüppellii. Ib. pl. 21. 1.

bicolor. Ib. pl. 21. 3.

longicauda. Ib. pl. 21. 2.

viridis. Bl. pl. 222.

flammiceps. Bennett. Ceylon Fish. pl. 24.

niger. Rüpp. Atl. ii. pl. 8. 1.

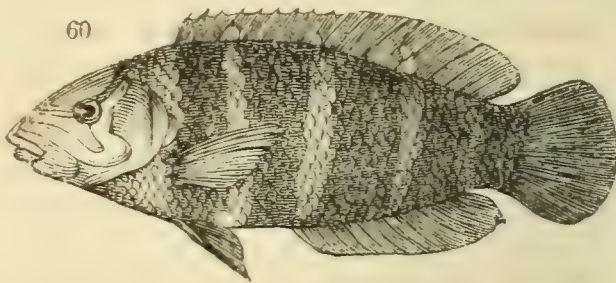
collana. Ib. fig. 2.

pulchellus. Ib. fig. 3.

Erychthys Sw.

(*fig. 60.*)

Nostrils circrated; caudal rounded or truncate: representing *Calliodon*?



E. croicensis. Bl. pl. 221.

quinque-fasciatus. Benn.

Cey. pl. 23. (*fig. 60.*)

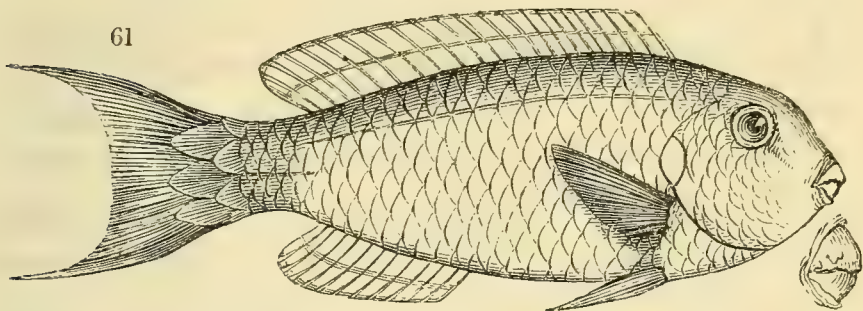
viridescens. Rüpp. ii. 7. fig. 2.

cæruleo-punctatus. Ib. 3.

Chlorurus Sw. (fig. 61.) Head obtuse; forehead gibbous; caudal fin lunate, with the two extremities attenuated; lateral line interrupted.

C. gibbus. Rüpp. Atl. pl. 20. fig. 2.

61



Sparisoma * Sw. General form of *Petronason*, but the scales are hexagonal, and (according to Bloch) the jaws are furnished with sharp incisive teeth and obtuse canines.

S. Abildgardii. Bloch, pl. 259.

OSTORYNCHUS Lacep. Mouth and jaws considerably elongated; the under jaw longest; teeth as in *Scarus*; eyes large; head naked; dorsal fins two (?), which, with the anal, are very short; caudal large, lunate; lateral line indistinct: analogous to *Gomphosis*, &c.

O. rostratus. Lacep. iv. 24. Shaw, G. Zool. iv. 2. 401.

AMPHISCARUS † Sw. Jaws as in *Scarus*, strong, bony, and entire, or without any tooth-like indentures on the edges; lips thick; in all other respects of outward structure resembling *Siganus*; dorsal and anal fins with numerous spinous rays, but no visible incumbent spine in front; ventral fin with two spinous, and three soft rays; scales small; caudal forked; lateral line indistinct?

A. fuscus. Griff. Cuv. pl. 35.

* Cuvier terms this singular fish a *Scarus*, and Bloch, a *Sparus*. The genus *Odar* of Cuvier is too slightly defined for me to adopt, and no figure of the fish exists.

† I have ventured to characterise this fish as a distinct type among the *Scarinae* on the authority of the above plate, where the jaws are more distinctly represented in a separate figure; a more extraordinary instance of symbolical representation I hardly ever met with.

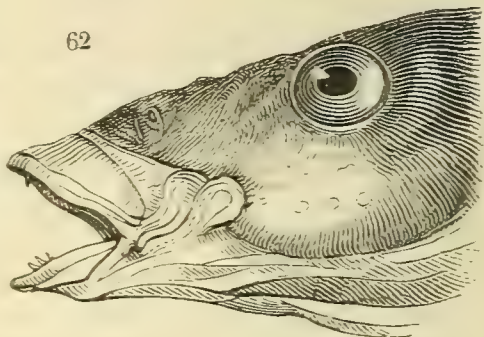
5. SUBFAM. LABRINÆ.

Body oval, fusiform; colours brilliant; lips very thick and fleshy; cutting teeth sharp, simple, distinct, those in front longest; operculum always smooth; preopercule sometimes serrated; lateral line abruptly bent, or totally interrupted at the end of the dorsal fin.

LABRUS Linn. Preoperculum always smooth; lateral line continuous*, but abruptly bent; head covered with scales, but rarely with any on the fins; pectoral and caudal rounded; ventral small.

Labrus Linn. (fig. 62.) Dorsal fin of equal breadth throughout, or slightly emarginate between the spinal and soft rays, the simple rays being as numerous as the branched ones, and having short loose filaments on their inner sides; caudal and pectoral fins rounded; ventrals small; jaws lightly protractile.

62



L. vetula. Bloch, pl. 293.

Lachnolaimus Cuv. Anterior rays of the dorsal lengthened into flexible filaments.

L. suillus Cuv. Catesby, ii. pl. 15.

Hemiulius Sw. Body slender, fusiform; dorsal fin of equal breadth throughout, with all the rays branched and soft; caudal fin slightly lunate; lateral line variable: representing *Ophicephalus* and *Chromi-labrus*.

H. vittatus. Griff. Cuv. pl. 6. 1. *auratus*. Frey. Atl. pl. 54. 2. *guttatus*. Bloch, pl. 357. 1. *melapterus*. Bloch, pl. 296. 2.

Cychla Bloch. Mouth large, wide; the under jaw longest; dorsal fin naked, slightly emarginate; teeth very small: the chironectiform type.

C. saxatilis. Bloch, pl. 309. *labrina*. Spix, pl. 62. fig. 2. *triglioides* Sw. Spix, pl. 63. *fasciata* Sw. Hamilt. fig. 23.

* Except in *Cheilinus*.

Cheilinus Cuv. General form and structure of *Labrus* proper, but the pectoral and ventral fins are pointed ; the dorsal and anal partly covered with scales ; lateral line interrupted ; caudal fin rounded.

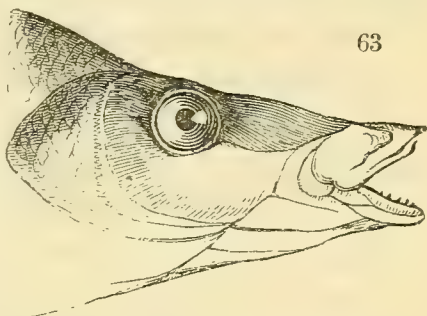
C. fasciatus. Bloch, pl. 290.

CRENILABRUS.* Lateral line neither curved nor interrupted ; preoperculum (in the typical groups) finely crenated ; strong cutting teeth in front of each jaw ; ventrals moderate ; operculum scaly.

Crenilabrus Cuv. Preopercule crenated ; caudal fin lunate ; dorsal and anal fins covered at their base with scales, dilated and pointed behind ; pectoral and ventral fins equal, and pointed ; mouth rather large, with sharp cutting teeth on the sides, and others much larger in front.

C. verres. Bloch, 255. *Chabrolii*. Lesson, Atl. pl. 58.

Cynædus Sw. (fig. 63.) Preopercule crenated ; caudal fin rounded ; dorsal and anal fins naked, without scales ; pectoral and ventral fins rounded, the latter small ; mouth small ; teeth as in *Crenilabrus* ; jaws capable of being much protruded.



<i>C. Tinca</i> . Yarr. i. 293.	<i>rupestris</i> . Bloch, pl. 250. fig. 1.
<i>cornubicus</i> . Ib. 296.	<i>virens</i> ? Ib. 251. fig. 2.
<i>gibbus</i> . Ib. 298.	<i>notatus</i> . Ib. 251. fig. 2.
<i>luscus</i> . Ib. 300.	

Astronotus† Sw. Body oval, broad ; head obtuse ; mouth large, opening obliquely, the lower jaw longest ; teeth strong in front, small on the sides ; dorsal, anal,

* M. Cuvier having expressly stated that the type of his genus *Crenilabrus* is the *Lutianus Verres* of Bloch, we have so retained it, placing all the others, which seem peculiar to European seas, under the sub-genus *Cynædus*, derived from *Cynædo*, a name which the ancients gave to one of the species.

† The strong analogical resemblance of this sub-genus to *Lobotes* deceived MM. Spix and Agassiz, in supposing it really belonged to that genus ; hence I am led to suppose it may have the preopercule crenated. The lateral line, and many other characters, leave, however, little doubt of its belonging to this sub-family.

and caudal fins covered with scales ; the pectoral and caudal round the ventral pointed ; lateral line interrupted ; representing *Cichla* ; preoperculum crenated ?

A. ocellatus. Spix, pl. 68.

Thalliurus Sw. General structure of *Crenilabrus*, but the fins have only a few scales at the base, and the preoperculum is smooth ; mouth moderate ; long acute cutting teeth at the top of each jaw ; those on the sides short, conic, separate, and obtuse ; dorsal spines furnished with short filaments, as in *Labrus* ; caudal lunated ; pectoral and ventral pointed and equal ; lateral line interrupted.

C. Blochii. Bloch, pl. 260.

Plesiops. Ventral fins excessively long ; operculum scaled ; preoperculum smooth ; teeth setaceous, often minute, and very fine ; cutting teeth in front of the jaws either very small or none.

*Labristoma** Sw. Head obtuse ; only three of the anterior dorsal rays short and spinous ; the others, both simple and branched, being flexible ; pectoral fin rounded ; ventral pointed and long ; caudal lunated ; lateral line interrupted ; front teeth of the jaws as in *Labrus* ; mouth small, not protractile.

L. olivacea. Rüpp. ii. pl. 2. fig. 3. *flavivertex*. ii. pl. 2. fig. 4.

Chromis Cuv. (pars.) Body oval, rather broad ; forehead high ; dorsal fin with strong spines and filaments ; pectoral and ventral fins very large, and both of them pointed ; caudal lunate ; mouth very small ; teeth setaceous, minute, and hardly perceptible ; without any larger cutting teeth in front.

C. melanogaster Sw. Bl.

Surinamensis Cuv. Bl. pl.

296. fig. 1.

277. fig. 2.

Cichlasoma Sw.† General structure of *Chromis*, but the caudal and the large pectoral fins are rounded ;

* The name of *Pseudo-chromis* is so objectionable, that I hope the learned naturalist who proposed it will excuse me for offering another. This interesting type obviously represents the *Blennides* and *Labristomus*, which implies its resemblance to *Labrus*.

† I have been induced to regard this fish as a distinct type ; because, from Bloch's figure, it seems a form which connects *Crenilabrus* with *Cheilinus*, as here restricted : the teeth are very peculiar, and separate it from *Chromis*, to which, however, it has a resemblance in its pointed and rather lengthened ventral.

ventrals very long and pointed ; lateral line abruptly bent ; mouth small, oblique ; dorsal and anal fins very long, and attenuated behind ; representing *Cichla*.

Labrus punctata. Bloch, pl. 295. fig. 1.

Plesiops Cuv. Head obtusely pointed ; dorsal spines nearly naked, slightly connected at their base, and assuming the appearance of finlets ; analogous to *Polypterus* ; caudal fin rounded ; the basal scales large, as in *Scarus* ; lateral line interrupted.

P. nigricans. Rüpp. Atl. i. pl. 4. fig. 2.

GOMPHOSIS. Mouth excessively lengthened, either by being greatly protractile or by the head being elongated ; preoperculum smooth ; head scaled.

Epibulus Cuv. Teeth as in *Labrus* ; long cutting teeth at the tip of each jaw, and smaller ones on the sides ; scales large, covering the base of the anal and caudal fins ; lateral line interrupted ; mouth excessively protractile, and tubular when protruded.

E. insidiator. Pall. Sp. Zool. 7. pl. 5. fig. 1.

Clepticus Cuv.* Snout small, cylindrical, but not so long as the head when protruded ; body oblong ; head obtuse ; operculum, with the dorsal and anal fins, covered with scales ; lateral line continuous ; teeth nearly obsolete.

C. genizara Cuv. Parra. pl. 21. fig. 1.

Gomphosis Lac. Snout not protractile, but lengthened into a permanent tube at the termination of which is the mouth, which opens horizontally, and extends half way towards the eye ; head without scales ; fins naked, like those of *Icthycallus* : caudal fin lunate.

G. viridis. Benn. Cey. pl. 30. *fuscus*. Ib. pl. 3.

* As I have not been able to consult the original description and figure of this type, I am obliged to rest it on the authority of M. Cuvier. Parra's work on the Fishes of Cuba is rare, and I have been unsuccessful in procuring its loan. Indeed the only copy I know of is in the possession of William Sharp MacLeay, Esq., the author of *Horæ Entomologicæ*. I take this opportunity of returning my public and grateful thanks to many kind friends and liberal strangers for the loan or gift of valuable works in this department. Among these I cannot but mention Chief-justice Field of Gibraltar ; Dr. Goodall, the provost of Eton ; W. J. Broderip, Esq., F.R.S. &c. ; W. Brewen, Esq. of Leicester ; Mr. Gray of the British Museum ; the Linnæan Society of London ; Dr. Rüppell, the African traveller ; Mr. Yarrell, &c. &c.

Eupemis Sw. Head naked, much lengthened, but not tubular, as in *Gomphosis*; body slender and narrow in the middle; mouth large, opening rather obliquely; the jaws equal; teeth as in *Labrus*; dorsal fin naked, linear; the spinal rays very slender, without filaments, and all of equal length; lateral line nearly straight; caudal round; pectoral and ventral very small, slightly pointed; analogous to *Cichla*.

E. fusiformis Sw. Rüpp. Atl. ii. pl. 1. fig. 4.

Julus Antiq. Body fusiform; head and gill-covers entirely destitute of scales (*fig. 57. d*); teeth at the tip of the jaws longest; lateral line abruptly curved and continuous.

Chloriethys Sw. Teeth as *Labrus*, the two most anterior incisors in each jaw longest; dorsal fin very narrow; the anterior spinal rays rather the shortest, with the membrane cut into short filaments; caudal fin more or less lunated, with the extremities pointed: connecting this genus to *Hemiulus*.

bifasciatus. Bl. pl. 283.

ornatus. Ib. pl. 280.

Braziliensis. Ib. pl. 280.

lunaris. Ib. pl. 281.

cæruleocephalus. Frey.

Atl. pl. 56. fig. 2.

Grayii. Sw. Ind. Zool. ii. pl. 92. 1.

Hardwickii. Benn. pl. 12.

quadricolor. Less. Atl. pl. 32. 1.

semicæruleus. Rüpp. Atl. ii.

pl. 3. fig. 1.

aygula. Rüpp. Atl. i. pl. 6. 2.

Iethycallus Sw. The first or spiny rays of the dorsal shorter than the posterior; representing *Labrus*; general structure of the last, but the scales are smaller, and often concealed by the skin; caudal fin truncate or rounded.

dimidiatus. Spix, pl. 53.

chloropterus. Bl. pl. 288.

trimaculatus. Griff. pl.

45. fig. 2.

decussatus. Benn. pl. 14.

auromaculatus. Ib. 20.

semidecorata. Less. Atl.

pl. 35. fig. 2.

Geoffroyii. Frey. Atl.

pl. 56. fig. 3.

umbrostygma. Rupp. Atl. ii.

pl. 3. fig. 2.

semipunctatus. Ib. pl. 3. fig. 3.

cynocephalus. Ib. pl. 286.

julis. Ib. pl. 287. fig. 1.

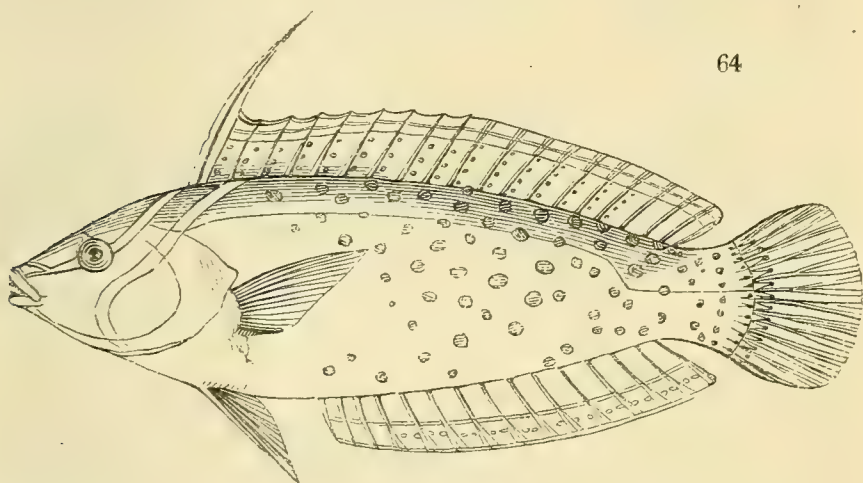
bivittatus. Ib. pl. 284. fig. 1.

macrolepidatus. Ib. fig. 2.

ornatus. Linn. Tr. xii. pl. 27.

Julis Antiq., Cuv. (*fig. 64.*) The anterior rays of the dorsal elevated, and somewhat falcate; caudal fin rounded; ventral fin narrow and pointed; representing *Lachnolaimus*.

Mediterranea* Risso, Gaymardii. Frey. pl. 54.
Yarr. p. 291. formosus Sw. Benn. Cey. pl. 16.



Halichores Rüpp. General shape and structure of *Ichthyallus*, but there is a conspicuous canine tooth, as large as those in front, at the hind part of the upper jaw on each side, and which projects beyond the mouth; ventral fins longer than the pectorals, and pointed; caudal truncate or rounded; representing *Chromis*, *Plesiops*, &c.

multicolor.† Rupp. Atl.	melapterus? Bloch, pl. 285.
ii. pl. 4. fig. 3.	eximius. Rüpp. Atl. ii. pl. 5.
variegatus. Ib. pl. 4. 2.	fig. 1.
cæruleovittatus. Ib. pl.	bimaculatus. Ib. fig. 2.
4. 1.	sexfasciatus. Ib. fig. 3.

Anampsis Cuv. General shape of the last, but the ventrals are small; the front incisors in each jaw are flat, obtuse, and sometimes curved outwards; no basal canines as in *Halichores*: representing *Scarus*.

Cuvieri. Frey. Atl. pl. 55. fig. 1. cæruleopunctatus. Ib. i.
diadematus. Rüpp. ii. pl. 6. 3. pl. 10. 1.

* I suspect that this is the true *Julis* of the ancients, and not the one standing under that name in our systems. Even the figure of *Rondeletius*, rude as it is, represents the anterior dorsal spines longer than the other.

† This interesting species, by having the first dorsal ray a little longer than the others, connects this sub-genus with the last.

FAMILY 3. MUGILLIDÆ. *Mulletts.*

Body oblong, narrow, sub-cylindrical; snout short, obtuse, generally projecting beyond the mouth, which is very small, transversely cleft, and pointed in front; dorsal fins two, remote, the first of strong spinal rays; teeth very small; eyes large, close to the snout; caudal fin forked or lunated.

MUGIL Linn. Head cylindrical; the upper part with hard and bony plates, the sides covered with compact scales, which conceal the divisions of the gill-covers; pectoral fin simple pointed.

M. gymnocephalus Sw. *squamipinnis Sw.* See Appendix.
Russ. pl. 180.

POLYNEMUS Linn. Head slightly compressed; body and fins closely resembling *Mugil*, but the preopercule is serrated, and the muzzle is rather more advanced; head and three hinder fins more or less covered with scales; pectoral fins as in *Mugil*, but having at its base several unconnected articulated rays, resembling filaments, which are often very long.

P. tetradactylus. Russ. 183. *enneadactylus. Griff. Cuv.*
Indicus. Russ. pl. 184. *pl. 11. fig. 1.*

FAMILY 4. MULLIDÆ. *Surmulletts.*

Shape obovate; the anterior part thicker than the posterior; head large, high; profile abrupt, sub-vertical; eyes placed laterally, but close to the crown; mouth and teeth very small; the ventral profile of the fish nearly straight; opercula and body covered with large deciduous scales; the former without any denticulations; dorsal fins two, remote; lower jaw with two fleshy cirri placed beneath; caudal forked.

MULLUS Linn. Head large and truncate; the profile very abrupt; teeth in the jaws almost obsolete; operculum smooth.

M. barbatus. Bl. pl. 384. fig. 2. Cuv. pl. 70.

UPENEUS Cuv. Head more lengthened, as in the generality of fishes; operculum furnished with a small spine; the teeth in the jaws conspicuous.

luteus. Griff. Cuv. pl. 11. 4. *Flamingii*. Cuv. pl. 71.

FAMILY 5. SPIROBRANCHIDÆ.

Vent close to the pectoral fin; ventral fin generally extremely long, narrow, and ending in a filament; upper pharyngeals of the branchia divided into numerous laminæ, or plates; dorsal fin single, not much longer than the anal, both furnished with numerous spiny rays.

MACROPODUS Cuv. Caudal fin excessively large, and deeply lunated or forked; body ovate, fusiform; dorsal and anal fin with numerous spiny rays; the terminal soft rays gradually lengthened, and ending in filaments; ventral fins with all the rays developed, the second ending in a filament; anal longer than the dorsal.

M. venustus. Cuv. pl. 197.

COLISA. Caudal fin either very slightly emarginate, or entirely round; one of the ventral rays forming a long filament; the others minute, or entirely obsolete.

Trichopus Cuv. Dorsal fin very short, placed in the middle of the back; anal very long, commencing near to the base of the pectoral, and terminating close to the caudal, which is slightly emarginate; the bases of all these fins are covered with minute scales; pectorals rounded; ventral fins minute; but the first soft ray terminating in a long filament.

T. maculatus Sw. Cuv. pl. 199.

Colisa Cuv. Caudal fin nearly round; dorsal and anal fins very long, and of equal length; the base of all three covered with scales; ventral of a single filiform ray, reaching to the end of the tail; pectoral rounded.

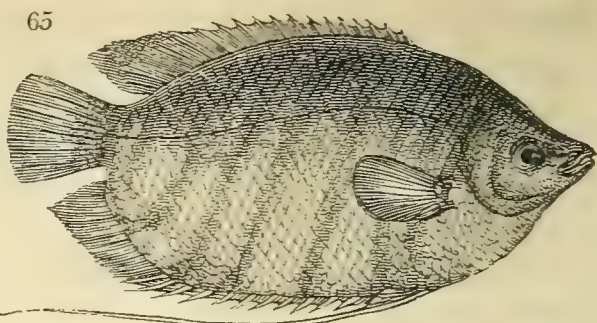
C. vulgaris. Cuv. pl. 196.

Osphromenus Cuv. (*fig. 65.*) Caudal fin rounded;

body broadly ovate, fusiform; general shape of Colisa, but the hinder rays of the ventral fins

are developed; snout rather pointed.

O. olfax. Cuv. pl. 198. (*fig. 65.*)



Polycanthus Kuhl. Body oval, compressed; the two profiles of the outline symmetrical; lateral line interrupted as in *Labrus*; operculum smooth; ventral fins pointed, but not longer than the pectorals; all the rays developed.

P. Hassellii. Cuv. pl. 195. *colisa*. Griff. Cuv. pl. 52. 1.

HELOSTOMA Kuhl. Body ovate; ventral fins rounded, perfect, smaller than the pectorals, and without any elongation; dorsal and anal spines numerous.

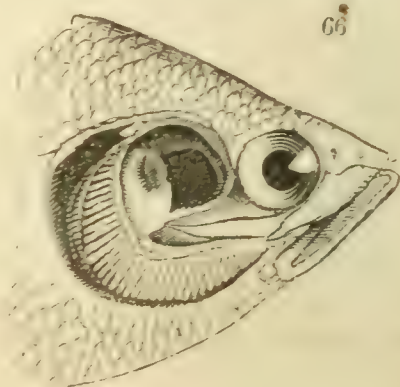
Helostoma Kuhl. Mouth very small, compressed, and very protractile; lips thick, with small teeth attached to them; head and hinder fins entirely covered with scales; dorsal and anal slightly emarginate, and broader behind; all the fins rounded.

H. Temminckii. Cuv. pl. 194.

SPIROBRANCHUS. Body sub-fusiform; mouth larger than in any of the preceding, having internal tessellated teeth; ventral fins rounded.

Spirobranchus Cuv. (*fig. 66.*) Plates of the gill-covers smooth, except a few 'points' on the upper part of the opercula; spines in the dorsal and anal fins few; the base of the hinder scaly, and all of them rounded.

S. capensis. Cuv.
pl. 200.



Anabus Cuv. General form of the last ; head and body cylindrical, and covered with strong scales ; lateral line interrupted as in *Labrus* ; hinder fins covered with small scales ; spines of the dorsal and anal fins numerous, and both these fins emarginate, the soft rays forming a lobe ; outer margin of the operculum strongly serrated ; preoperculum smooth ; anal fin shorter than the dorsal.

A. scandens. Cuv. pl. 193.

OPHICEPHALUS.* The whole of the fins destitute of spinal rays ; lateral line nearly straight.

Ophicephalus Bl. Body lengthened, nearly cylindrical, having the form of a blenny ; snout short and obtuse ; head broad, a little depressed, and covered with bony plates ; eyes near the muzzle ; mouth large, lower jaw rather longest ; dorsal fin narrow, extending the whole length of the back ; ventral shorter ; caudal, pectoral, and ventral rounded ; gills smooth, and covered with scales.

O. striatus Bl. Cuv. 202.

limbatus. Cuv. 201.

TRIBE II. MICROLEPTES.

Scales small or none.

FAMILY 1. SCOMBERIDÆ. *Mackerel*.

Body oblong, lengthened, smooth, covered with very small scales ; caudal fin deeply forked, large, and powerful ; tail often bearing spurious fins or finlets ; no fleshy lips.

* It is by this genus, intimately connected as it is with *Anabus*, that the two great tribes of *Blennides* and *Macroleptes* appear blended into each other. The *Spirobranchidæ*, as a whole, are analogous also to the eels, in their power of passing by land from one piece of water to another.

1. SUBFAM. SCOMBERINÆ.

Dorsal fins two, entire ; tail with spurious fins both above and below ; ventral fins beneath the pectoral.

SCOMBER Linn. Body lanceolate, uniformly covered with minute scales ; sides of the tail, at the extremity, not carinated, but merely raised into two small crests on each side, one above, the other below.

S. scombrus. Bloch, 54.

gracilis Sw. Appendix.

pneumatophorus Lac.

undulatus Sw. Appendix.

Auxis Antiq., Cuv. Dorsal fins distant ; the first short, as in *Scomber*.

A. vulgaris. Cuv. and Val. pl. 216.

2. SUBFAM. THYNNINÆ.

Scales largest near the head ; dorsal fins close together.

THYNNUS Cuv. First dorsal fin long, nearly reaching to the second ; fore part of the body with scales much larger than the others ; tail with a single smooth angulated keel on each side between the elevated ridges peculiar to the last.

T. vulgaris. C. and V. pl. 210. Ency. Brit. 302. fig. 3

Orcynus Cuv. Habit of *Thynnus* ; pectoral fins falcate, very long, and reaching beyond the vent.

O. alalonga Duham.

Pelamis Antiq., Cuv. General structure of *Thynnus*, but the mouth and teeth are like those of *Cybius*.

Pelamis sarda. Cuv. and Val. pl. 217.

Cybius Antiq., Cuv. Body rather elongated ; the scales small, and of equal size ; the teeth large, compressed, and sharp ; the mouth large, opening beyond the eye ; fins and tail as in *Thynnus*.

C. tritor. Cuv. and Val. pl. 218.

THYRSITES Ant., Cuv. Body elongated ; jaws rather produced, the lower one longest ; mouth wide,

opening beneath the eye ; first dorsal fin very long ; tail not carinated ; anterior teeth longest.

T. lepidopoides. Cuv. and Val. pl. 220.

Gempylus Cuv. Body much elongated ; head, jaws, and teeth as in *Thyrsites*, but without palatine teeth ; ventral fins very minute, placed before the pectorals ; lateral line curved, and marked with large scales ; pectorals falcate.

G. Prometheus. Cuv. and Val. pl. 222.

ZYPHOTHYCA Sw. Body very long, linear, and greatly compressed ; lateral line straight, simple ; mouth opening before the eye ; the lower jaw much the longest, with the chin elongated and pointed ; ventral fin minute, of two little rays, placed behind the pectorals which are oval.

Z. coluber Sw. Cuv. and Val. pl. 221.

3. SUBFAM. XIPHYINÆ Linn. *Sword-fish*.

Upper jaw excessively prolonged, considerably flattened above, the edges sharp ; the mouth is placed beneath ; ventral fins either wanting, or of a single inflexible bone in each ; branchial arches two, not pectinated.

XIPHIAS Linn. Ventral fins none ; tail singly carinated on each side.

Z. gladius. Cuv. and Val. pl. 225, 226.

TETRAPTERUS Raf. Body nearly cylindrical ; snout narrow ; ventral fins with a single bony ray ; tail doubly carinated on each side ; dorsal fin very long, falcate near the head ; eyes large.

H. belone. Raff. Caratt. p. 54. pl. 1. fig. 1.

HISTIOPHORUS Cuv. Ventral fins of two unequal rays, connected by a membrane ; mouth opening behind the eye, which is very large ; caudal fin small, lobed.

H. pulchellus. Cuv. and Val. 230.

ZANCLURUS Sw. Body with hard oblong scales ; ventral fins of two long equal rays ; eyes very small ;

pectorals rather lengthened, falcate; caudal fin very large, divided into two sickle-like lobes; the base singly or doubly carinated.

Z. Indicus *Nob.* Cuv. and Val. pl. 229. Bloch, 343.

MACHÆRA *Lac.* Snout short; habit of *Tetrapterus*, which it resembles in having the tail doubly carinated, and the point of the upper jaw not dilated; but resembles *Xiphias* in having no ventrals; tail lunate, large, as in *Zanclus*.

M. niger. Lacep. iv. pl. 13. fig. 3.

4. SUBFAM. ALEPISAUURINÆ.

Body lengthened, linear, much compressed; head lengthened, pointed; teeth large, unequal, very acute; mouth wide, two dorsal fins, the hinder adipose; scales none.

ALEPISAUURUS *Lowe.* The first dorsal fin very high, and extending two-thirds the length of the back; adipose fin small; ventral fin beneath the middle of the first dorsal; anal fin short, narrow, falcated; caudal large, deeply cleft; gape extending much behind the eye, which is very large; pectorals rather large, close to the throat: intermediate between *Gomphylus* and *Lepidopus*, and representing *Sphyræna*.*

A. ferox *Lowe.* Zool. Trans. i. pl. 19.

5. SUBFAM. FISTULARINÆ.

Body long, very slender, linear, naked, and without scales; jaws prolonged into a tube, at the extremity of which is a small mouth, opening vertically; no spines on the back.

FISTULARIA *Linn.* Dorsal fin single; snout very long and depressed; caudal forked, between which is in-

* The relations pointed out by the excellent zoologist who first discovered and described this singular genus appear to me highly probable, and yet the possession of an adipose fin is without parallel in the whole of this order.

served a long filament: the plectognathiform type, representing *Syngnathus*, *Centriscus*, *Mormyrus*, *Gomphosis*, *Aspidophorus*, &c.

F. tabacaria Linn. Bloch, 387. fig. 1. serrata. Ib. fig. 2.

FAMILY 2. ZEIDÆ.*

Body, in the typical groups, ovate or short; the back armed with spines or prickles, placed before the dorsal fins, which are generally single; jaws capable of being protruded; scales small or none; ventral fins present.

1. SUBFAM. NOTOCANTHINÆ.

Body anguilliform, much compressed; dorsal and anal fins, when present, very long, and close to the caudal; a series of detached spines before the dorsal fin; snout produced. The anguilliform or apodal type.

NOTOCANTHUS Bl. Body with small scales; snout obtuse, projecting beyond the mouth; jaws equal, with small close-set teeth; ventral fins close to the vent; no dorsal fin; anal long, and united to a very small caudal fin.

N. nasus. Bl. 431. Cuv. and Val. pl. 241.

MASTECSEMBLUS Gronov. Snout projecting and flattened, three-cleft, cartilaginous, and inclining upwards; dorsal, caudal, and anal fins united.

Mast. armatus. Cuv. and Val. 240.

Macrognathus Lac. Snout more pointed; the top three-cleft, and turned downwards; caudal fin separated.

Macrognathus ocellatus. Val. and Cuv. pl. 239.

2. SUBFAM. AULOSTOMINÆ. *Prickle, or Sticklebacks.*

Back armed with a row of prickles; the snout often prolonged into a tube.

* I am at a loss to determine the distinguishing character of this family, although I believe it to be, essentially, a most natural one: the gradation between the *Zeinæ* and the *Centronotinæ* is so perfect, that they cannot, I think, be placed in separate families, although the latter has the strongest affinity to the *Scomberidæ*.

AULOSTOMA *Lac.* Snout greatly prolonged; the mouth small, and obliquely vertical; body sub-cylindrical, covered with close-set scales; dorsal and anal fins close, but not united to the caudal; back with a row of dorsal spines; vent and anal fin central; caudal and pectoral rounded; teeth none.

A. *Chinensis.* Bl. pl. 388.

POLYCANTHUS *Sw.* Body very slender, linear, pentangular; jaws lengthened; mouth small, terminal, obliquely vertical; lateral line carinated; dorsal and anal fins central; tail slender; ventral fins represented by spines.

P. *spinachia.* Sw. Yarrell, i. 87. Bloch, pl. 53. fig. 1.

GASTEROSTEUS *Linn.* Body oblong-ovate; anterior dorsal, and ventral fins represented by acute spines; second dorsal and anal placed near the caudal; sides of the body armed with carinated or spined plates along the lateral line.

G. *trachurus.* Yarrell, i. 76. *semiarmatus.* Ib. i. 80.

Leiurus *Sw.* Resembling the last, but the loricated plates are wanting, and the tail is smooth.

aculeatus. Yarr. i. 81. *brachycentrus.* Yarr. i. 82.
 spinulosus. Ib. i. 83. *pungitius.* Ib. i. 85.

2. SUBFAM. SPHÆRINÆ.

Body linear; jaws produced, broader than high; mouth large; teeth strong, those in front much lengthened; dorsal fins two, triangular, remote; ventral fin under the first dorsal.

SPHYRÆNA *Cuv.* Body much lengthened; jaws produced, equal, but the chin advanced and pointed as in *Trichiurus*; dorsal fins placed at equal distances from the head and the caudal fin.

S. *Europea.*

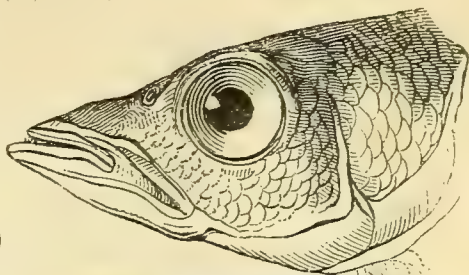
PARALEPIS *Cuv.* Habit of the last, but the two dorsal fins and the ventral placed much nearer to the caudal than to the pectoral fins; lateral teeth unequal, distant.

P. *corregonoides.* Cuv. and Val. 66.

CHIROSTOMA Sw. (*fig. 67.*) Snout slightly produced; teeth small; body oblong; first dorsal fin small, placed over the vent.

67

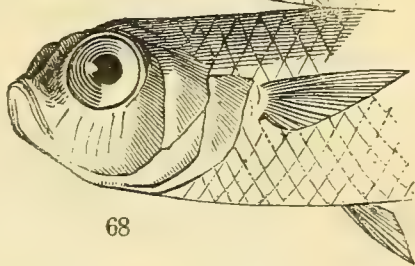
A. Humboldtiana. Cuv. and Val. pl. 306.* (*fig. 67.*)



ATHERINA Linn. (*fig. 68.*)

Snout very obtuse; the mouth opening nearly vertically; eyes very large, close to the snout; first dorsal placed between the ventral and the anal fins.

68



A. hepseus Linn. Cuv. pl. 302. (*fig. 68.*) *A. Boieri.* pl. 303.

4. SUBFAM. CENTRONOTINÆ.

Body lengthened or oblong; spines in front of the dorsal; ventral fins perfect; scales generally very small.

ELACATE Cuv. Body lengthened, slender; mouth wide; lower jaw the longest; dorsal and anal fins opposite the former, preceded by a row of acute spines or prickles, representing the first dorsal; lateral line smooth, sinuated.

Elacate Cuv. Body lengthened; scales very minute; dorsal and anal fins long, with several detached spines in front of the former; head lengthened, depressed; mouth wide; lower jaw longest; eyes behind the gape; pectoral and caudal large; ventral small; tail not carinated; lateral line undulated; three first rays of the anal spinous, but without any detached spines.

E. Atlantica. Cuv. pl. 233.

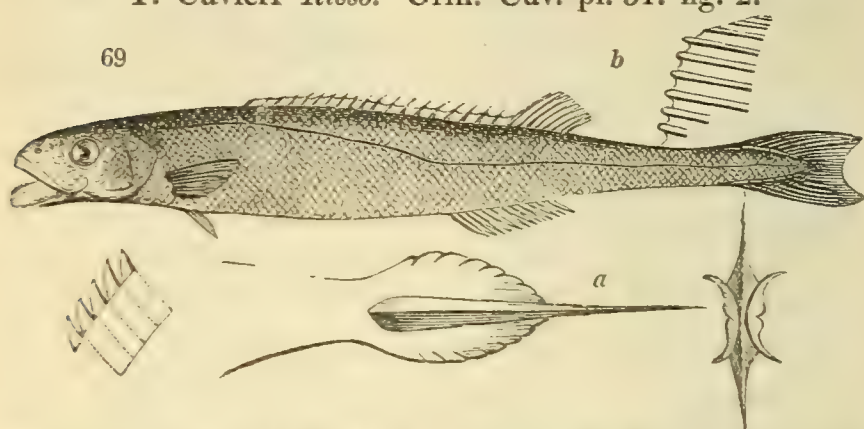
Meladerma Sw. General structure of *Elacate*, but the under jaw is shorter than the upper.

M. nigerrima. Russ. pl. 153. (*Pedda. mottah.*)

* This type seems to me to connect *Sphyræna* with *Atherina*, as it possesses some of the characters of both.

Tetragonurus Risso. (fig. 69.) General form of *Elacate*, but the dorsal and anal fins are much shorter, and there are two ridges on each side of the tail, at the base of the caudal (*a*); before the dorsal a series of detached spines; scales small but hard, deeply striated (*b*), and crenated on the edges; mouth nearly vertical; lower jaw with a row of acute teeth, and others in the palate and vomer: the cheloniform type?

T. Cuvieri Risso. Griff. Cuv. pl. 51. fig. 2.



Chorinemus Cuv.* Body elongated as in the mackerel, but the general shape of the head and position of the dorsal and anal fins as in *Elacate*; mouth large, opening obliquely; gape reaching in a line with the eye; detached spines before the dorsal and anal; both fins long, falcate before and very narrow behind, where the rays are detached into finlets; caudal lunate, without any carinated ridges at its base; pectoral small, equal to the ventral; lateral line sinuated.

Ch. maculatus Sw. Cuv. pl. 236.

Porthmeus Cuv. Small, oblong-oval; head pointed; mouth very wide, opening beyond the eye; lower jaw much the longest; the chin rather pointed; dorsal spines connected at their base by a slight membrane; pectoral and ventral as in the last; caudal forked; preoperculum obsoletely spined.†

P. argenteus Cuv. pl. 264. fig. 2.

* This sub-genus bears a strong resemblance to that of *Scomber* proper, by the detached dorsal finlets, but in every other respect it has the closest possible affinity to *Elacate*.

† This type seems to connect the *Elacatæ* with the *Trachinæ* by means of *Zonichthys*.

CENTRONOTUS Lac. Body oblong or oval ; mouth moderate or small ; the jaws equal, and not opening behind the eye ; dorsal fin one, preceded by small detached spines ; lateral line curved and smooth ; jaws retractile ; anal fin small, but always present.

Trachinotus Lac. Body oblong-oval, much compressed, and rather broad ; snout short, thick, obtuse, sometimes nearly vertical ; eyes placed low down, and remote from the crown ; mouth small ; dorsal and anal fins falcate, the latter shortest ; dorsal spines small, remote, sometimes pointing forwards ; caudal without ridges at the base.

T. pampanus. Cuv. pl. 237.

Centronotus Lac. Body oblong-fusiform ; snout not obtuse ; head narrowed ; dorsal and anal fins of equal length, and falcated ; mouth small ; jaws equal ; a prickle pointing forward on the back ; tail not carinated ; caudal large, forked ; scales minute.

quadripunctatus Sw. Rüpp. i. 24. glaycos Sw. Cuv. pl. 234.

Lichia Cuv. General shape of *Centronotus*, but the anal fin, as in *Trachinotus*, is shorter than the dorsal ; mouth large, opening beyond the eyes, which are low down ; lower jaw longest ; tail not carinated.

L. vandigo. Cuv. pl. 235.

Naucrates Raf. Body thick, oblong, ovate ; ventral fins as large as the pectoral ; anal shorter than the dorsal ; mouth small ; jaws equal ; tail with a fleshy carinated ridge ; dorsal and anal spines minute.

ductor. Sw. App.

serratus. App.

cyanophrys. App.

niger. Bl. pl. 3.

*Scorpiis** Cuv. Resembling in shape a *Chætodon* ; the dorsal spines being connected and graduated so as to join the dorsal fin ; anal spines the same ; and both fins with the caudal partly covered with minute scales ; teeth strong, acuminate ; dorsal and anal fins

* This singular fish seems to me a *Centronotus* in the disguise of a *Chætodon*, just as is *Enoplosus* among the perches.

subfalcated; caudal forked; scales small, distinct; ventral moderate, pointed.

S. georgianus. Cuv. pl. 245.

SERIOLA. Body oblong; dorsal fins two, distinct, the first spinous, and having an incumbent spine, pointing forwards at its base; pectoral fins small, pointed, but not falcated; scales of the body small, but well-defined and obvious; two spines close to the base of the anal fin; tail not carinated.

*Nomeus** C. General shape and character of *Naucrates*, but the dorsal spines are united into a distinct fin by being connected with a membrane; tail not carinated; ventral fins very large, considerably exceeding the pectorals in the typical species; pectorals, and lobes of the caudal fin, rounded.

Peronii. Griff. Cuv. pl. 26. 1. *nigro-fasciatus*. Rüpp. i. argyromelas. Cuv. pl. 269. pl. 24. fig. 2.

Temnodon Cuv. First dorsal fin much smaller and lower than the second; mouth large, lower jaw longest, both armed with detached acute teeth in each jaw in the front row, and others much smaller behind; velvet-like teeth are also on the tongue, palate, and vomer; second dorsal and anal covered with small scales: representing *Scorpius*.

saltator. Cuv. pl. 260.

Seriola Cuv. Body oblong, fusiform; first dorsal fin small, low, with an incumbent spine at its base, pointing forward; second dorsal long; the posterior rays short; the rays sometimes divided into finlets; pectoral and ventral fins about equal.

S. Dumerilii. Cuv. pl. 258.

Psenes Cuv. Body broad, oval; snout very short, obtuse, nearly truncate, having the general form and proportions of *Trachinotus*; first dorsal fin as high as the second, and without an anterior spine directed

* The discovery of the first species in our list connects *Seriola* and *Centronotus* in the most perfect manner by the union of *Naucrates* with *Nomeus*.

forwards; hinder dorsal, caudal, and anal covered with minute scales; ventral fins very small.

P. cyanophrys. Cuv. pl. 265.

Platylepes Sw. Body oblong, oval; mouth large, obliquely vertical; lower jaw longest; both jaws with numerous small teeth, and two much larger at their tips; lateral line formed of a row of flat smooth scales, larger than the others; the hinder fins with minute scales at their base; ventral fin small.

P. lactaria. Cuv. pl. 261.

SIGANUS* *Forskill*. Body oval; a recumbent spine in front of the dorsal fin, which is single, long, deeply emarginate, with more spinal than soft rays; ventral fins moderate, attached to the body by a membrane; the two outermost rays simple and spinous, the three intermediate branched; mouth small, with compressed and emarginate teeth; pectorals small, pointed; colours bright: analogous to *Labrus*.

Forskillii. Rüpp. i. pl. 33. *doliatus*. Griff. pl. 33. 1.

Argylepes Sw. Body oval, naked; dorsal fin single, high before, narrow behind; the posterior rays short, and very remote; anal with two spines before the base; lateral line central, slightly bent downwards†; pectoral moderate, falcate; eyes large; mouth very small; "the teeth linear;" tongue and palate smooth.‡

A. Indica. Russ. pl. 156. (*Mitta Parah.*)

TRACHINUS *Sw*. Pectoral fins large and falcated; lateral line almost always armed with a series of large, spined, imbricate scales, particularly towards the end of the tail§; body not much compressed, smooth,

* The procumbent advanced spine before the dorsal induces me to place this genus between *Seriola* and *Caranx* rather than with the *Acanthuri*. It seems to represent the *Labrinæ* in this family, and to have an affinity with *Psenes*.

† I strongly suspect that Dr. Russell has mistaken the lateral impression along the vertebra for the real lateral line, which is probably obsolete.

‡ I have arranged this singular fish in the confines of this family, as having some relation to *Siganus* in its small mouth and single dorsal, and to *Caranx* in its general form; but Dr. Russell's description is not sufficiently precise to determine all its characters: it seems in some respects allied to *Equula*.

§ Excepting only the three first or aberrant sub-genera.

soft, with minute scales ; head large ; dorsal fins two, distinct, the hinder long, and with those of the anal having the rays wide apart and much branched ; caudal lunate ; no isolated spines on the back, except sometimes a recumbent one before the first dorsal.

Micropteryx Agass. Lateral line arched before, straight behind, elevated, but smooth ; body broad, but the extremities narrowed ; pectoral fin very long and falcated ; jaws protractile ; head small ; mouth opening rather vertically, lower jaw longest, both rough, but without visible teeth ; first dorsal grooved ; second dorsal and anal with a transparent fleshy sheath at their base ; before the anal two short connected spines ; ventrals small, beneath the pectoral, vent close to the head ; scales very small.

M. Cosmopolitana. Cuv. 250. Spin. and Agass. pl. 59.

Alepes Sw. General form of the last in the head and body, but entirely destitute of scales, except those on the hinder part of the lateral line adjoining the caudal fin ; teeth minute ; dorsal fins two, the first higher than the second ; and this latter has all the rays nearly equal ; pectoral large and falcate.

A. melanoptera. Sw. Russel. pl. 155. (Evori. Parah.)

Zonichthys Sw. General form of *Alepes* ; but the lower jaw is longest, the head thicker, and the whole fish more oval, and covered with small scales ; dorsal fins two, the first lower than the second ; ventral fin larger than the pectoral ; no incumbent spine on the back, but two spines behind the vent ; pectoral small, sub-falcate ; lateral line arched before, but slightly, if at all, loricated at the tail ; jaws and palate with prickly teeth ; branchial membrane six-rayed ; teeth minute.

Z. fasciatus. Bloch, pl. 341.* subcarinata. Russ. pl. 149.

* Cuvier refers this fish to the genus *Seriola*, but it has no incumbent spine in front of the dorsal, and it seems to me, judging from Bloch's figure, to have more the characters of *Caranx*: the species here referred to, and figured by Russell, appears to connect Bloch's fish with the more typical examples of *Caranx*; and both may possibly be allied in affinity to *Porthmeus*.

Caranx Lac. Body oval, or oblong-oval, broad, compressed; lateral line on the fore part arched, on the hinder part straight, carinated, and armed with loricated prickly scales, gradually becoming larger as they approach the caudal; dorsal fins two, the first small and low; two detached spines before the anal; pectoral long, falcated; scales minute.

1. Dorsal and anal more or less falcated; body short.

C. chrysophrys. Cuv. pl. 247.

2. Dorsal and anal rays prolonged into filaments.

(*Olistus*. Cuv.)

3. Ventral fins very long. Russell, pl. 152.

4. Forehead gibbous. *C. Ascensionis*. Cuv. pl. 249.

5. Body lengthened, as in *Trachinus*; pectoral very long; ventrals small.

ruber. Bloch, pl. 342.

Trachinus Sw. Body fusiform, lengthened; lateral line slightly curved near the head, and strongly loricated nearly its whole length; first dorsal fin as high as the second, which sometimes has finlets.

1. Plates extending the whole length of the lateral line.

T. spinulosus. Cuv. pl. 246.

2. Plates extending to one half of the lateral line; tail with finlets.

T. punctatus. Spix and Agass. pl. 56. fig. 1.

3. Plates near the caudal fin only; no finlets.

macrophthalmus. Spix and Ag. pl. 59. *a.* fig. 2.

crumenophthalmus. Bloch, pl. 343

5. SUBFAM. ZEINÆ. *Dories*.

Body short, oval, or rhomboid, very broad in the middle, and excessively thin; mouth very small, often very protractile; dorsal fin generally single*, without any detached or recumbent spines placed in front; scales very minute, or none; caudal forked.†

Equula Cuv. Body often diaphanous, short, oval; mouth capable of being projected in the form of a tube, but when shut forming an angle on the throat; scales either soft and smooth, or altogether wanting.

Equula Cuv. Dorsal fin single, not emarginate, somewhat falcate; the first rays of the dorsal and ventral

* Except in *Hamiltonia* and *PLATYSOMUS*.

† Except in *Zeus*.

strongly spinous, the latter with a scaly appendage at the base ; pectoral fins moderate, pointed ; a row of spines at the base of the dorsal and anal.

Dussumierii. Cuv. pl. 283. filigera. Cuv. 284.

Hamiltonia Sw. Dorsal fins two, united at their base ; body diaphanous, and always smooth ; preopercule finely crenated. (*Chanda*, Ham.)

H. ovata. Sw. Ham. fig. 37. *lata*. Sw. Ib. fig. 37.

PLATYSOMUS Sw. Body rhomboid, excessively thin ; head large, obtuse ; the profile abrupt, and sometimes nearly vertical ; body silvery, without scales ; dorsal, anal, and ventral fins often with the rays excessively elongated ; pectorals large, falcate ; caudal forked ; eyes large, placed near the crown, and very remote from the mouth, which is small, and but slightly retractile ; lateral line smooth, arched before, and straight behind ; dorsal fins generally one.

Blepharis Cuv. First rays of the ventral, dorsal, and anal fins excessively prolonged, and ending in naked filaments ; hinder rays short ; a few short prickles before the dorsal and fins ; eyes often placed near the mouth.

sutor. Cuv. pl. 253. *gallichthys* Sw. Cuv. pl. 254.

Platysomus Sw. Ventral fins very minute, or nearly obsolete ; profile of the head almost vertical ; crown gibbous ; dorsal and anal fin long and low ; the rays not prolonged ; eyes central between the crown and mouth, a few spines before the dorsal fin. (*Vomer* Cuv.)

Brownii. Cuv. pl. 256. *Micropteryx* Sw. App.

Spixii Sw. Spix. pl. 57.

Argyriosus Cuv. General form of the last, but the profile is oblique ; ventral fins fragile and pointed ; dorsal fins two ; the first of three or four short spines connected by a membrane ; second dorsal and anal long and narrow, but with the anterior rays excessively prolonged, as in *Blepharis* ; lateral line smooth.

triacanthus Sw. Spix. pl. 58. *filamentosus*. Sw. Cuv. pl. 255.

Scyris Cuv. General structure of *Argyriosus*, but with only one dorsal fin, as long as the anal, and both with

their anterior rays much lengthened ; ventrals small, pointed ; lateral line slightly carinated at the end of the tail, where there are two fleshy ridges at the base of the caudal.

Rüppellii Sw. Rüpp. i. pl. 33. *Indicus*. Cuv. pl. 252.

Hynniss Cuv. Posterior part of the body, beyond the vent, rather lengthened ; ventral fins moderate ; dorsal and anal fins falcate, but the rays not prolonged ; lateral line and tail as in *Scyris* ; no prickles before either the dorsal or anal.

H. Goreensis. Cuv. pl. 257.

LAMPRI *Retzius*. Body oval, nearly rhomboid ; scales none ; head and mouth small ; belly protuberant ; dorsal fin one, excessively falcated ; ventral the same, and placed beneath the commencement of the dorsal ; anal fin long, narrow ; pectoral moderately large, falcate.

L. guttatus Retz. Cuv. pl. 282. Griff. Cuv. pl. 58. f. 2.

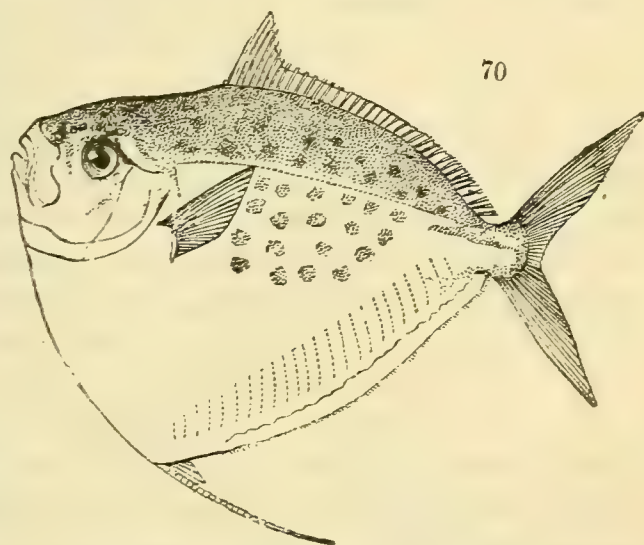
Mene. Cuvier.

(fig.70.)

General shape of *Lampris*, but even broader and thinner ; ventral fin single, of only one lengthened ray, the rest being obso-

lete ; mouth very small, opening vertically.

M. maculata. Cuv. pl. 285. (fig.70.)



APOLECTUS *Cuv*. Body rhomboid ; scales soft, minute ; snout thick, obtuse, and truncate ; mouth small ; eyes large, placed close to the mouth ; dorsal and anal falcate, with a few prickles at their base ; pectoral long, falcate ; ventrals small, attenuated, pointed,

as long as the pectoral, and placed immediately on the throat ; caudal small ; representing *Trachinotus*, *Psenes*, and the *Coryphænæ*.

A. stromateus. Cuv. pl. 238.

ZEUS *Linn.* Body hispid, either with spines or rough and hard scales ; caudal fin rounded ; dorsal fins two.

Zeus. Body oval, with small distinct scales, and a row of prickles at the base of the dorsal and anal fins, and on the ridge of the belly ; other spines on the gills ; head very large ; the eyes close to the crown ; mouth large, very protractile ; pectoral small, round ; ventral large ; dorsal rays often ending in long filaments.

Zeus faber *Linn.* Yarr. i. 162. *pungio*. Cuv. pl. 280.

Capros *Lac.* Scales hard, and strongly ciliated on their margins ; dorsal fins united ; the rays of the first dorsal, and of the anal and ventral, are very strong ; eyes very large ; mouth as in *Equula*, and very protractile ; preopercule finely serrated.*

C. aper *Lac.* Cuv. pl. 281.

FAMILY 3. CORYPHÆNIDÆ.

Body greatly compressed, elongated ; scales minute or none ; dorsal fin long, single, with nearly all the rays soft ; snout obtuse, prominent ; the jaws not protractile ; mouth small, generally placed beneath the snout ; ventral fins always small, and sometimes wanting.

1. SUBFAM. CORYPHÆNINÆ.

Body oblong, slender, covered with small scales ; head large ; crown gibbous ; pectoral fins falcate ; eyes close to the angle of the mouth.

CORYPHÆNA *Linn.* Ventral fins larger than the pectorals.

hippuris. Cuv. pl. 266. *C. siculus* *Sw.* Cuv. 268.

LAMPUGUS *Cuv.* Ventral fins equal to the pectorals.

L. equisetis. Cuv. 267. *immaculata*, Spix. pl. 56.

* The affinity of this type to *Equula* is sufficiently obvious ; it might, indeed, be placed under that genus, next to *Hamiltonia*, were it not for its stronger affinity, if possible, to *Zeus*.

2. SUBFAM. STROMATINÆ.

Body very thin, short, rhomboid, back with minute prickles; head obtuse; ventral fins generally none.

SESERINUS Cuv. Body oval, broad; vent and dorsal fin as in *Centrolophus*; ventral fin very minute, placed before the pectoral; caudal slightly lobed.

C. microchirus. Cuv. and Val. pl. 276.

STROMATEUS Lin. Ventral fin none; body oblong-rhomboid; with the head and part of the fins covered with small scales beneath the soft epidermis; head obtuse, as in *Coryphæna*; belly short; caudal very large, lunulate.

S. fiatola Linn. Cuv. and Val. pl. 272.

PEPRILUS Cuv. Body rhomboid; snout obtuse; eyes very large; the dorsal and anal fins of equal length with small, cutting, two-pointed spines placed before them; caudal large, forked.

P. longipinnis. Cuv. pl. 274. *Securifer,* Cuv. pl. 273.

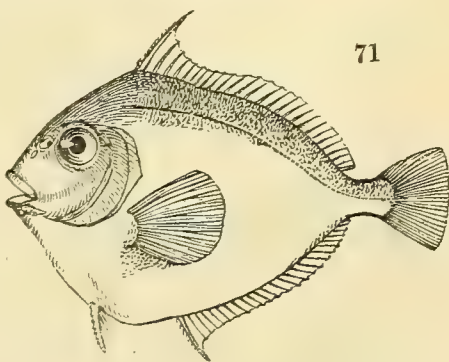
KURTUS Bloch. Body lengthened, rhomboid; dorsal fin short, central; tail and anal fin very long; vent under the pectoral; mouth large, obliquely vertical; preopercule serrated; dorsal spines variously shaped; ventral fins perfect, placed before the pectorals; scales invisible.

K. Blochii Lac. Cuv. and Val. pl. 277.

KERIS Cuv. (fig. 71.)

Body rhomboid, with the general shape of *Priodon*; pectoral and caudal fin rounded; first spinal ray of the dorsal and anal fins rather lengthened and serrated externally; the

caudal truncate; ventral fin anterior to the pectoral,



very small; the first ray serrated; the rest nearly obsolete.*

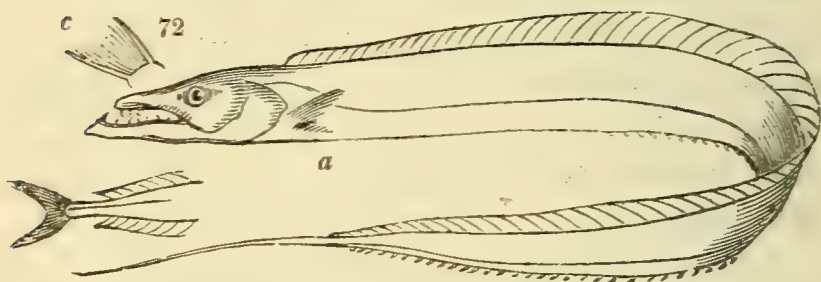
K. arginosus. Cuv. (*fig. 71.*)

3. SUBFAM. TRACHIURINÆ.

Ventral fins wanting, or merely rudimentary; finlets none; body narrow, linear; jaws lengthened, the under much the longest, and having the chin pointed; teeth, in general, large, remote, unequal, and acute.

TRICHIURUS *Vand.* (*fig. 72 a.*) Caudal fin none; the tail being gradually narrowed and attenuated to a point; anal fin none; dorsal fin commencing on the nape, and extending nearly the whole length of the body.

haumela *Sch.* Cuv. pl. 224. (*lepturus* *Auct.*)



LEPIDOPUS *Gouan.* Caudal fin small and forked (*fig. 72. b.*); pectoral falcated in the middle (*c*); head, body, and dorsal fin as in *Trichiurus*; but there is a short and narrow anal fin.

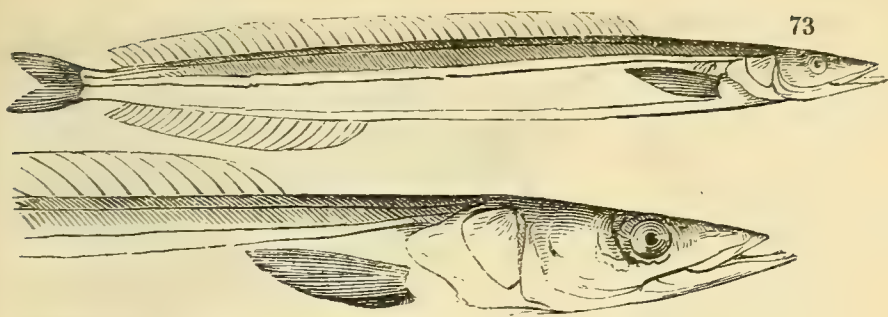
L. ensiformis *Vandeli.* Cuv. pl. 223.†

AMMODYTES *Linn.* (*fig. 73.*) Pectoral fin simply pointed; anal fin long and fully developed; caudal forked; lateral line close to the dorsal; teeth small.

Siculus. Zool. Ill. i. series 1. pl. 63.

* This singular type appears to represent, in this sub-family, the *Acanthurinæ* and the genus *Prionon*: if this view is correct, its analogy to all the serrated rayed fishes, as *Trigla*, *Balistes*, *Siluridæ*, &c., becomes manifest.

† M. Cuvier has changed the specific names of these two fishes without any necessity. I have restored Schneider's to one, and Vandelli's to the other; the references which follow are merely for the figures. It is quite obvious that *Lepidopus* is intimately allied to *Ammodytes*, though placed by Cuvier, without any assigned reason, in a different order.



4. SUBFAM. ASTRODERMINÆ.

Crown gibbous, obtuse ; mouth and eyes very small ; ventral fins nearly obsolete, placed before the pectorals ; rays of the dorsal and anal fins simple.

ASTRODERMES Bonnelli. Body lengthened, oval ; ventral fins nearly obsolete, the first ray serrated ; body with scattered, detached, starlike scales.

A. coryphenoides Bon. Cuv. and Val. pl. 270.

CENTROLOPHUS Lac. Body shorter ; dorsal fin commencing even with the pectoral ; ventral fin small ; anal fin half as long as the dorsal ; vent central ; lateral line prominent.

C. pompylus. Cuv. and Val. 269.

5. SUBFAM. ACANTHURINÆ.

Body ovate or oblong ; mouth very small.

ACANTHURUS. Body oval ; sides of the tail armed with one moveable spine.

Acanthurus Forskahl. Body scaly ; the dorsal fin subdivided, anterior rays remote ; caudal fin truncate.

A. triostegos. Cuv. x. 199.

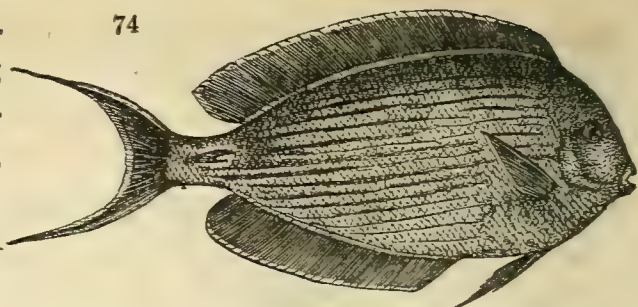
Teuthys Linn. Body with a coriaceous or granulated skin, often marked with vertical or longitudinal carinated lines ; dorsal entire ; caudal slightly forked.

T. argenteus. Frey. Atlas, pl. 63. f. 3.

Ctenodon Sw. (*fig. 74.*) Body scaly ; dorsal fin undivided ; the spines very slender ; caudal fin very

large, greatly lunated; head very obtuse; teeth, in general, spatulose and crenated.

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- C. Rüppelii* Sw. Rüpp. 16. (fig. 74.) *rubropunctatus*. Rüpp. 15. 1.
Cuvierii. C. v. pl. 289. *lineatus*. Sw. Benn. pl. 2.
fuliginosus. Lesson. 27. 2. *erythromelas*. Less. Atl. 27. 1.

Harpurus Forster. Snout contracted and produced, somewhat tubular; body granulated and marked longitudinally with carinated lines; a brush-like tuft of hairs on the sides of the tail.

H. *scopas*. Cuv. pl. 280.

Zebrasoma * Sw. Snout rather pointed; dorsal and ventral fins excessively broad and rounded; body without scales; tail truncate.

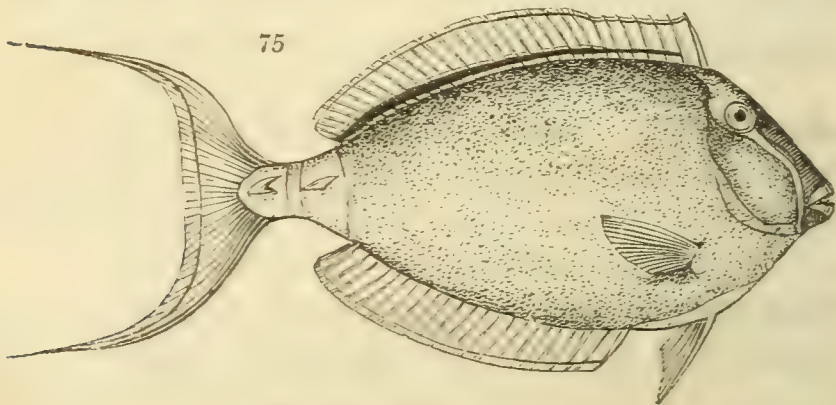
velifer. Sw. Rüpp. Atlas, pl. 15. fig. 2. Bl. pl. 427.

PRIONURUS Lac. General aspect of *Acanthurus*; but the caudal spines are many; body coriaceous, without scales; dorsal fin one.

Callicanthus Sw. (fig. 75.) Head sloping; caudal spines two on each side; ventral fins immediately under the pectoral, and with a connecting membrane; caudal large, lunated, the point attenuated.

C. elegans. (*Aspisurus elegans*.) Rüpp. Atl. 16. fig. 2. (fig. 75.)

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* This type, uniting to *Acanthurus* proper, completes the circle of the genus.

Aspisurus Lac. Snout contracted, produced, and somewhat tubular; dorsal spines strong and remote; caudal fin small, truncate, or slightly lunate.

A. Lamarekii. Frey. Atlas, pl. 63. fig. 1.

Prionurus proper. General aspect of *Aspisurus*, but the dorsal has an advancing spine; the caudal spines fixed; the tail small and slightly lunate.

P. microlepidotus Lac. Cuv. v. pl. 292.

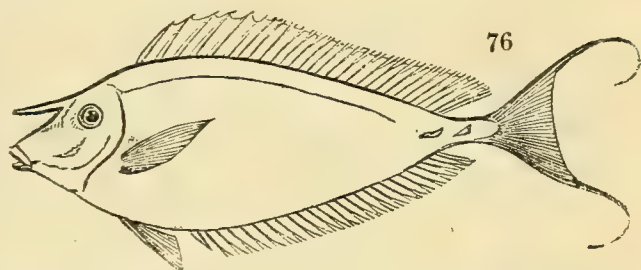
NASEUS Cuv.

(fig. 76.)

General aspect of *Prionurus*, but the front is

prolonged into a horizontal horn; the caudal spines are fixed, and the teeth conical; ventral fins with only a few soft rays.

N. fronticornis Cuv. (fig. 76.)



PRIODON. General shape and teeth of *Acanthurus*: the skin coriaceous; but the tail is unarmed, and the ventrals like *Naseus*.

P. annularis. Cuv. and Val. pl. 294.

AXINURUS Cuv. Body ovate, coriaceous; belly very short; tail with a single square, sharp, and fixed plate; caudal fin lunate; ventral fins very small.

Axinurus thynnoides. Cuv. pl. 295.

TRIBE III. GYMNETRES. *The Riband-fish.*

Body very long, excessively thin; pectoral fin minute; head large, truncate; eyes very large; mouth nearly vertical.*

1. SUBFAM. PTERACLINÆ.

Dorsal and anal fins excessively broad.

PTERACLES. General shape of *Astrodermus*, but the

* The primary divisions are mostly representatives of families.

dorsal and anal fins are enormously developed ; the former commences on the crown, and the latter just behind the eye ; eyes and mouth very large.

Pteracles ocellatus. Cuv. and Val. pl. 271.

2. SUBFAM. GYMNETRINÆ.

Body excessively long and thin, the dorsals extending the whole length of the body ; pectoral minute ; ventral very large ; no anal fin.

ARGYCTIUS Rafinesque. Dorsal fins generally two ; the first very narrow at the base ; but greatly prolonged, so as to form a sort of crest on the head.

Argyctius proper, Rafinesque.* Dorsal fin one, narrow ; ventral fins long, subulate, of three united rays, without a membrane, but with a short anterior spinous ray ; caudal forked (?), of six rays.

quadrimaculatus. Raf. Car. p. 55. pl. 1. fig. 3.

CEPHALEPES Raf. General habit of *Argyctius* ; dorsal fins two ; the first of three or four rays, one of which is excessively prolonged and spatulate at the tip, the others very short ; anal large, angular, and pointed ; caudal of six simple rays, more or less connected by a membrane.

C. octomaculatus. Raf.

Swainsonii. Raf. Journ.

Ind. See Appendix.

2. p. 36. See Appendix.

TRACHYPTERUS Cuv. Dorsal fins two ; the first of about seven very long equal rays ; caudal fin as in *Cephalepes*, but vertical ; anal represented by a few small obsolete processes or bristles at the base of the caudal.

Spinolæ. Cuv. pl. 296.

iris. Cuv. pl. 297.

GYMNOGASTER Brunich. General structure of *Argyctius* ; but the sides of the body armed with a series of spines, pointing forwards ; dorsal fin single ; pectoral very small ; ventral and anal fins wanting ; caudal forked ?

G. articus Brun. Yarrell, i. 191.

* Science is much indebted to Dr. Fleming for a valuable paper on this rare fish in *Loudon's Magazine*, iv. p. 215.

GYMNETRUS *Bloch.* Body excessively long; ribband-shaped; ventral fins very long; the rays simply filiform or spatulate.

Gymnetrus proper, *Bloch.* Front and mouth nearly vertical; crown with a distinct fin, resembling a crest; ventral fins filiform, ending in a spatulate plate.

G. gladius. Cuv. and Val. pl. 298. *telum.* Ib. pl. 299.

Xiphichthys *Sw.* Ventral fin of a single filiform ray, ending in a fine point; caudal fin fusiform, of four rays connected at the base, and afterwards joined, where they all terminate in one slender filament.

Z. Russelii. *Sw.* Russ. i. p. 40.

Lophotes *Giorna.* Crown of the head very high, elevated above the mouth and surmounted by a recurved horn-like process; dorsal fin as long as the body; caudal distinct, small; ventral very minute; anal close to the caudal, and just before the vent.

L. Cepedianus *Gior.* Cuv. pl. 301. *Siculus.* *Sw.* App.

3. SUBFAM. OPHIDONIDÆ.

Body anguilliform, more robust and less compressed; anal fin nearly as long as the dorsal, and united to the caudal; all the fins thickened.

XIPHASIA *Nob.* Body excessively long and linear; the ventral fins of a single filamentous ray.

Z. setifer *Sw.* Russ. pl. 39.

CEPOLA *Linn.* Body moderately long, gradually diminishing from the vent; head obtuse; pectoral fin rounded; ventral rather before the pectoral, smaller, pointed, attached by a membrane at the base; dorsal and anal fins united to the caudal.

<i>C. tænia</i> <i>Linn.</i>	<i>attenuata.</i> <i>Sw.</i> Appendix.
<i>rubescens</i> <i>Linn.</i> See App.	<i>gularis.</i> <i>Sw.</i> Ib.
<i>longicauda</i> <i>Sw.</i> App.	<i>variegata.</i> <i>Sw.</i> Ib.
<i>novemradiata</i> <i>Sw.</i> Ib.	<i>truncata.</i> <i>Sw.</i> Ib.
<i>gigas</i> <i>Sw.</i> Ib.	

NEMOTHERUS *Raf.* Pectoral fins filiform, placed very near each other towards the throat; ventrals and anal fins wanting; caudal fin lunate, with a very long filiform ray in the middle.

N. erythropterus. *Raf.*, *Specchio*, i. p. 101.

4. SUBFAM. OPHIDINÆ.

Body much thicker, anguilliform; fins more or less fleshy; ventral fins none; dorsal and anal fins united; caudal obsolete.

FIERASFER *Cuv.* (*fig. 77.*) Body hyaline; snout very obtuse; eyes small; no cirri.

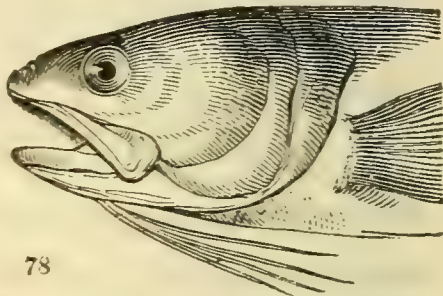


acus. *Risso*, i. 82. pl. 4. 11.

maculatus. *Sw.* *App.*

OPHIDIUM *Linn.* (*fig. 78.*)

Body anguilliform, opaque; eyes very large; throat furnished with cirri.



barbatum. *Bl.* 159.*

(*fig. 78.*)

Vassalli. *Risso*, *Nice.* i. p. 97.

5. SUBFAM. STYLEPHORINÆ.

Eyes pedunculated.

STYLEPHORUS *Shaw.* Body anguilliform, “very long, compressed; eyes pedunculated, standing on a short, thick cylinder; snout lengthened; directed upwards, retractile towards the head; mouth without teeth; pectoral fins small; dorsal the length of the back †;” “caudal vertical, as in *Trachypterus*, but shorter †;” the extremity of the tail prolonged into a slender filament longer than the body.

S. chordatus *Shaw.* *Linn. Tr.* i. 90. pl. 6.

* Cuvier and all authors describe this species as having four distinct barbels, whereas there is in reality only one, divided at its base into four filaments: no good representation yet exists of this species.

† *Shaw*

‡ *Cuvier.*

TRIBE IV. CANTHILEPTES. *Mailed-cheeks.*

Head and cheeks mailed, or armed with detached spines ; scales rough or prickly ; branchial aperture contracted ; pectorals often very large ; operculum spinous ; lateral line generally prominent, and often spinous.

FAMILY 1. LEPIDOLEPRIDÆ. *Riband Gurnards.*

Body anguilliform, sword-shaped, very thin, covered with osseous scales, rough, and beset with small acute spines ; head depressed, mailed ; dorsal fins two, the first small, the second long, and united with the anal and caudal, which forms a point ; ventral fins small.

LEPIDOSOMA *Risso.* Snout considerably prolonged, ending in a triangular point ; mouth large, placed beneath, as in Trigla ; jaws with several rows of very fine curved sharp teeth ; dorsal fins approximating, and of equal height ; ventral fins very narrow and slender, the first ray prolonged into a filament.

Lepidosoma trachyrinchus. Risso, Ichth. 197. pl. 7. fig. 21.

OXYCEPHAS *Raf.* Muzzle not prolonged over the mouth ; the first dorsal fin high and triangular ; the second shorter than the anal ; ventral fins small, short ; lower jaw with or without cirri.

O. cœlorhynchus. Riss. Scabrus. Raff. Carat. p. 31. Ich. 200. pl. 7. fig. 22.*

FAMILY 2. TRIGLIDÆ. *Gurnards.*

Head covered with bony plates, resembling armour, and defended with large spinal processes ; scales rough or cuspidate, or prickly ; caudal fin generally lunate ; distinct finger-like processes generally placed at the base of the pectorals ; pectoral fins mostly very large.

TRIGLA. The digitated processes free and detached ;

* Differs from the *O. Rupestris* of Bloch, by having, according to Rafinesque, the caudal fin emarginate.

generally three ; scales prickly ; suborbital bones very large, covering the cheeks ; the whole head hard and granulated ; dorsal fins two, the first composed of spiney rays, the anterior of which is sometimes serrated ; lateral line carinated ; teeth very small : Europe and India.

Trigla Linn. Pectoral and ventral fins of nearly equal length ; body covered with small scales ; caudal fin truncate or lunate.

gurnardus Linn.

Capensis. Cuv. iv. 55.

cuculus. Linn. Ib. 34.

Blochii. Yarr. p. 50.

hirundo. Bloch, pl. 60.

papilio. Cuv. iv. 80.

lineata. Ib. 354.

phalæna.

pini. Ib. 355.

papillionacea. Less. Atl. 19.

pœcilaptera. Cuv. iv. 47.

lyra. Bloch, 350.

Peronii. Ib. 53.

&c. See Appendix.

Prionotus Lac. Head very large ; pectoral fins nearly as long as the body ; caudal fin truncate or lunate.

tribulus. Cuv. pl. 74.

Ornichthys Sw. Pectoral fins very large ; spines on the head small ; caudal fin rounded ; lateral line smooth ; America ; ventral fins very small.

Carolinensis. Bl. 352.

punctatus. Ib. pl. 353.

Peristidion Lac. Body angulated, lengthened, slender, entirely covered with large scale-like plates, which form carinated angles along the body ; mouth without teeth, placed beneath two projecting plates on the muzzle, and furnished with short branched cirri ; digitated processes two on each side.

P. cataphracta. Bloch, pl. 349.

DACTYLOPHORUS. Head very obtuse ; eyes very large, close to the tip of the muzzle ; crown of the head and angle of the operculum extended into very long spines ; pectoral processes united together.

Dactylophorus Lac. Pectoral fins nearly as long as the body ; the processes united, and forming a spurious fin.

volitans. Cuv.

trigloïdes. Sw. Appendix.

occidentalis. Sw. Appendix.

Orientalis. Cuv. pl. 76.

Blochii. Ib. App.

bispinosus. Russ. pl. 160.

tentaculatus. Ib. App.

Chinensis. Sw. App.

fasciatus. Ib. App.

Cephalocanthus Lac. Pectoral fins much smaller ; digitated processes wanting.

C. spinarella. Lac. Cuv. pl. 73. 77.

OPLICTHYS Cuv. General form of *Peristidion*, but the head is much broader ; the body very slender, lengthened, and marked with large plates ; a row of sharp spines form the lateral line ; pectoral fin moderate, very broad at the base ; and extended towards the throat, but without any digitated processes ; second dorsal and anal fins very long ; caudal ——— ?

O. Langsdorffii. Cuv. pl. 81.

RHYNCHICTYS Cuv. Body ovate-fusiform ; upper jaw projecting considerably beyond the lower ; the tip pointed, but the crown broad and sulcated ; eyes enormous ; scales regular, hard, and ciliated at their edges ; operculum and interoperculum with strong spines, and deeply serrated edges ; dorsal fins two, united.*

R. pelamidis. Cuv. and Val. pl. 204.

FAMILY 3. SCORPÆNIDÆ.

No digitated processes ; caudal fin rounded ; scales smooth ; eyes prominent, placed near the crown, on an elevated ridge of the head ; pectorals often long ; always very broad at the base, and extended towards the throat ; head armed with obtuse tubercles and scattered spines.

1. SUBFAM. SCORPÆNINÆ.

Head compressed ; mouth opening horizontally ; body, in general, covered with smooth scales ; eyes lateral ; pectoral fins with some of the lower rays detached, but destitute of digitated processes.

PTEROIS Cuv. Dorsal and pectoral fins very large,

* The affinities of these two last genera are somewhat uncertain. *Rhynchictys* obviously represents the sword-fish.

with many of the rays but slightly connected by the membrane ; pectoral rays deeply cleft ; no pectoral appendages, as in some of the Apisti ; head with short spines and fleshy lobes or cirri ; no teeth on the palate ; dorsal fins two, equal, but united ; ventrals very large.

Pterois Cuv. Dorsal fins very high ; pectoral fins as long as the body, or reaching to the base of the caudal fin ; the upper rays, as well as those of the first dorsal fin, deeply cleft ; caudal small, sub-lanceolate ; mouth opening horizontally.

volitans. Bloch, 184. Cuv. cristatus. Benn. Cey. pl. 1.
pl. 85. antennaria. Bloch, pl. 185.

Macrochyrus Sw. Pectoral fins only one third as long as the body ; in other respects resembles the last, but the mouth is subvertical.

miles. Benn. Cey. pl. 9.

Pteroleptus Sw. Pectoral fins very long, reaching to the base of the caudal, but the rays are not cleft, as in the two last ; first dorsal fin with the rays very high, and only connected by a membrane at their base ; mouth oblique.

P. longicauda. Russ. ii. pl. 133.

Pteropterus Sw. General structure of *Pterois*, but the dorsal fin is very low*, a doubtful type.

T. radiatus. Cuv. and Val.

Brachyrus Sw. Pectoral fins short, only one third the length of the body ; the first eight branched, the remainder simple, and all united nearly to the tips by the membrane.

zebra. Cuv. iv. p. 367. brachypterus. Ib. iv. p. 368.

APISTES. Pectoral fins moderately large ; the rays undivided, and all of them branched, with a digitated

* This type, if such it be, rests on the authority of a drawing by Parkinson in the Banksian Library. I do not think it probable that the dorsal rays, as conjectured by Cuvier, had been broken off, for Parkinson was a zoological painter, and would have been aware of the circumstance.

process, or detached ray at the base ; dorsal fin either entire or slightly cleft ; two strong spines on the gills, one on the suborbital, the other on the preopercule ; scales small or none ; palate furnished with teeth.

Pterichthys Sw. Pectorals very long, reaching to the base of the caudal, with a detached ray at the base, and a cirrus on the lower jaw.

P. carinatus. Cuv. iv. p. 395. *Israelitorum*. Cuv. iv. p. 396.
alatus. Russ. No. 160. B.

Apistes Cuv. (Also *Minous* Cuv.) Pectoral fins moderately long, with a lengthened, detached ray at the base ; scales very small or none ; spines on the operculum very strong, and with others elevated before the orbits ; ventral fin with the rays simple, the three first not thickened or lengthened ; dorsal fin either entire or cleft, the anterior division shortest.

monodactylus. Cuv. pl. 95. 2. *Russellii*. Russ. pl. 160. a. *

Platypterus Sw. Dorsal fin very high or broad, undivided, commencing between the eyes, and uniting by a membrane to the caudal fin ; pectoral fins pointed, moderate, and without any detached ray ; head very obtuse, truncate, the front almost vertical ; mouth opening obliquely or subvertical ; scales very minute ; caudal rounded. †

tænianotus. Cuv. Lac. iv. *longispinis*. Ib. iv. 408.

pl. 3. fig. 2.

Bourgomvillii. Ib. iv. 411.

fusco-virens? Ib. iv. 409.

Trichosomus Sw. Dorsal fins two, the first of three spinous rays, widely separated from the second ; mouth oblique or subvertical ; lower jaw longest ; pectorals as in the last ; anal with three strong spiny rays.

trachinoides. Cuv. pl. 92. 1. *dracæna*. Cuv. iv. p. 403.

Gymnapistes Sw. Body generally naked, shaped as in

* This species, by its undivided dorsal, connects *Apistes* to *Platypterus*.

† Cuvier observes that the caudal, as represented by Lacepede, is incorrect, having been injured in the original. When perfect it is rhomboid, or, in other words, rounded.

Scorpena; dorsal more or less cleft towards the tail; its first or anterior division consisting of spinous rays, the hinder of soft branched rays; pectoral fins moderate, but no detached ray; anal fin with three spines in front; no cirri on the head.

marmoratus. Griff. Cuv.

Belangerii. Cuv. iv. p. 412.

pl. 22. fig. 3.

barbatus. Ib. 413.

australis. White's Voy. pl.

niger. Ib. 415.

52. fig. 1.

SCORPÆNA Linn. Head large, armed with spines and tubercles; the sides compressed, destitute of scales, but furnished with fleshy cirri or lobes of different sizes; teeth minute, velvety, placed on the jaws, vomer, and palate; mouth obliquely horizontal; body ovate, covered with scales; pectorals moderate, the lower rays thick but not branched; dorsal fin deeply emarginate near the tail.

scrofa. Cuv.

venosa Cuv. Russ. pl. 56.

nesogallica. Griff. pl. 16. 2.

grandicornis. Cuv. pl. 86.

SEBASTES Cuv. Head and body compressed, and covered in all their parts with distinct scales; no fleshy lobes on the head, which is only of a moderate size; mouth cleft almost vertically; the under jaw longest, and the chin pointed; pectorals moderate, not very broad at the base, but the lower rays simple, as in *Scorpena*; head without tubercles or frontal prickles, but with a strong suborbital spine; dorsal fin emarginate near the tail; caudal truncate.*

variabilis. Griff. Cuv. pl. 22. fig. 1.

TENIANOTUS Cuv. Body ovate, broad, excessively compressed; head obtuse; front truncate; mouth obliquely horizontal; short obtuse spines above and before the eyes, and smaller ones on the gills; dorsal

* For the reason assigned by Cuvier, *i. e.* the simple rays at the lower part of the pectoral fin, I have followed him in retaining this genus near to that of *Scorpena*; but I am not quite satisfied this is its natural station. Its sub-vertical mouth shows a strong relation to *Trichodon*, which, from possessing the same character in the pectoral fins, but with a completely naked body, I have placed as the corresponding type in the sub-family of *Synanchina*.

fin very high or broad, undivided, and extending from the crown to the caudal fin, to the outer edge of which it unites; body scaly; the other fins as in *Scorpæna*: representing *Platypterus*.

T. triacanthus. Cuv. pl. 89.

2. SUBFAM. SYNANCHINÆ. *Hogfish*.

Body naked, without scales, thick, gross, often deformed with fungus or spongy skin, with fleshy lobes or cirri on the sides; head directed upwards, spinous; the eyes small and placed close to or upon the crown; mouth large, completely vertical*; pectorals large, often very long; the base broad and extended almost under the throat.

AGRIOPUS Cuv. General form and structure of *Tæniatus*, but the muzzle is suddenly narrowed and rather produced; the mouth very small and without teeth; dorsal fin slightly emarginate, commencing just between the eyes, and reaching, but not united, to the base of the caudal; pectoral fin rather small; all the rays simple; body compressed, smooth, or warted.

Peruvianus. Griff. pl. 8. 1. *verrucosus*. Cuv. pl. 91.

PELOR Cuv. Snout turned upwards; eyes small, vertical, pedunculated, or placed on a gibbous prominence of the crown; mouth large, vertical, the under jaw longest; pectoral fins very large; the rays often passing beyond the membrane, which leaves two or more of the lower rays almost free; dorsal fin long, entire, very broad, the membrane only connecting the rays towards the base; palate with small teeth; ventral fin large; anal long.

maculatum. Griff. pl. 8. 2. *filamentosum*. Cuv. pl. 94.

SYNANCHIA Cuv. *Hogfish*. Aspect hideous; head thick, cylindrical, covered with tubercles, and often

* Except in *Agriopus*.

deformed with fungous skin and fleshy lobes ; pectoral fins very broad at the base, but the rays are united, not much lengthened, and all branched ; eyes small, placed on the crown ; mouth large, opening vertically ; ventral fin large ; dorsal long.

Synanchia Cuv. Eyes large, lateral ; body and tail rather elongated, smooth ; dorsal fin narrow, united to the base of the caudal ; ventral fin very small ; anal lengthened ; head covered with fungous skin ; mouth oblique ; caudal rounded ; representing *Agriopus*, &c.

S. erosa. Cuv. pl. 96.

Bufilethys Sw. Body very thick ; tail short ; eyes very small, subpedunculated ; mouth large, completely vertical ; pectorals remarkably broad at their base ; ventral and anal very small, the former placed rather before the pectorals.

horrida. Lac. ii. pl. 17. 2. *grossa.* Gray. In. Zool. i. pl. 97.

Trachicephalus Sw. Shape and general aspect of *Trachinus* ; body lengthened ; dorsal fin emarginate, nearly in the middle ; caudal truncate ; anal fin long ; eyes approximate on the crown ; mouth large, vertical.

elongatus. Griff. Cuv. pl. 8. f. 3.

TRICHODON Cuv. General shape of *Trachinus*, but the body destitute of scales, and the suborbital spine, as in *Agriopus*, entirely wanting ; eyes large ; mouth wide, vertical ; dorsal fins two, low, of nearly equal length and breadth ; pectoral very broad ; the lower rays simple ; ventral fin small, placed beneath the pectoral ; anal fin long, linear ; caudal sublunate ; preoperculum toothed, as in *Agriopus* ; the Chironectiform type.

T. Stellerii. Cuv. pl. 57.

3. SUBFAM. BLEPSINÆ.

Ventral fins almost obsolete.

BLEPSIAS Cuv. Dorsal fin, as in *Hemitripterus*, divided into three portions, the two first of which are

short and triangular, but the hinder very long and high ; body ovate, naked ; head compressed, with several fleshy processes ; small spines on the preoperculum, but none behind the eye or on the operculum ; pectorals large ; the rays simple, those nearest the throat rather cleft between ; palate furnished with teeth ; ventral fin minute, nearly obsolete.*

B. trilobus. Cuv. iv. pl. 90. Griff. ed. pl. 22. f. 2.

4. SUBFAM. TRACHININÆ.

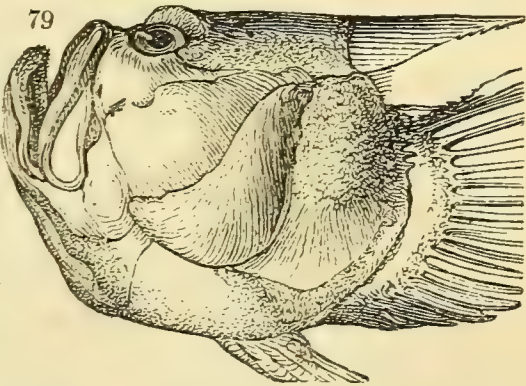
Mouth and eyes vertical ; body with compact scales ; ventral fin before the pectoral.

URANOSCOPUS. General form of Synanchia ; body covered with hard, compact, and often rough scales ; head and body cylindrical ; head mailed with hard plates, but without spines or processes ; pectorals large, broad ; the rays undivided ; ventral fins small, placed before the pectorals ; dorsal and anal fins long.

Uranoscopus Linn. (fig. 79.) Dorsal fins two, the first triangular, and formed of three to five acute spines.

U. scaber Linn. Bloch, p. 163.

Ichthyoscopus Sw. Dor-
sal fin single, long,
generally composed
of soft and simple
rays ; mouth often
furnished with cirri ;
scales minute, or
none.



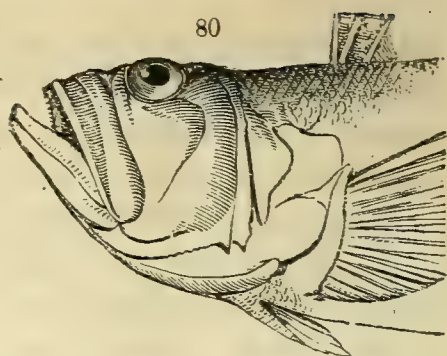
U. inermis. Cuv. iii. pl. 65. *cirrhusus*. Cuv. Ib. 314.
Forsteri. Ib. 318. *lævis*. Ib. 319.

TRACHINUS Linn. (fig. 80.) General shape of the last, but the body and head are much compressed ; operculum with a long acute spine on its upper angle ; dorsal fins two, the first triangular, with acute spines ;

* As evidence of the affinity of *Blepsis* to *Trachinus* it is not a little remarkable that Pallas placed them together.

the second, and the anal, long and linear ; caudal truncate ; scales small, hard ; ventral fin hardly before the pectoral.

T. draco Linn.
Yarrell. (*fig* 80.)



5. SUBFAM. PLATICEPHALINÆ. *Flatheads.*

Head and body broad and depressed ; ventral fins and eyes large, the latter vertical ; form slender ; dorsal fins two ; body scaly ; no tubercles or filaments on the head.

PLATYCEPHALUS Cuv. Head large, long, very broad ; armed with acute spines ; muzzle produced ; mouth opening horizontally, but the under jaw longest ; dorsal fins two, nearly equal ; pectoral broad, and reaching to the sides of the throat ; ventral fin very large, as long as the pectoral, and placed behind it ; caudal rounded ; gill membrane seven rayed ; palate with sharp teeth.

asper. Cuv. and Val. pl. 82. *grandispinis.* Griff. pl. 16. f. 1.

BEMBRAS Cuv. General form of *Platycephalus*, but the head is only as broad as it is high ; pectoral fins rather small, and not much longer than the ventrals ; which latter, as in *Trachinus*, are placed before the pectorals ; mouth horizontal ; both jaws equal ; dorsal fins two ; tail rather lengthened ; caudal fin truncate ; velvet-like teeth in the jaws, palatines, and vomer.

B. Japonicus. Cuv. and Val. iv. 282. pl. 83.

FAMILY 4. COTTIDÆ. *Bull-heads.* *Miller's Thumb.*

Ventral fins small, imperfect, generally of three, but never more than four, rays, and placed behind the pectorals ; body naked, or with patches only of minute scales ; head large, broad, depressed, armed with spines and tubercles ; mouth large ; small teeth on the jaws and

vomer, but none on the palate ; pectoral fins broad ; the lower rays simple ; dorsal fins generally two, either separated or united at their base ; gill membrane six-rayed.

HEMITRIPTERUS *Cuv.* Habit of *Synanchia*, in the head, eyes, and pectoral fins ; but the mouth is obliquely horizontal, and the dorsal fin is divided into three portions ; the first falcate, or triangular ; the two others equal ; head depressed, with numerous sharp tubercles and fleshy palmated cirri ; ventral fin very small, of only one spinal, and three soft, rays ; anal lengthened ; caudal truncate ; palate furnished with small teeth.

H. Americanus. *Cuv.* pl. 84. *Griff.* *Cuv.* pl. 53. f. 3.

COTTUS *Linn.* Body entirely naked ; dorsal fins two, distinct ; preopercule armed with spines.

gobio. *Bl.* pl. 39. *Yarr.* i. 56. *Scorpius.* *Bl.* pl. 40. *Klen.*
diceraus. *Til. Mos. Tr.* pl. 13. *Miss.* iv. pl. 13. f. 2.

ENOPHRYS *Sw.* Nape of the head contracted ; spines few ; orbits much elevated, and surrounded with a bony lobe or plate, rendering the fore part of the head club-shaped ; dorsals distinct ; ventral fins short, of three rays ; body naked ; caudal rounded.

E. claviger. *Cuv.* and *Val.* pl. 79. fig. 2.

GYMNOCANTHUS *Sw.* Resembling in general aspect the last, but there are no upper orbits ; spines of the head few, and naked ; ventral fins very long, and of three rays ; dorsals distinct ; the rays of the first naked on their terminal half (?) ; caudal fin truncate.

G. ventralis. *Cuv.* and *Val.* iv. pl. 79. fig. 1.

HEMILEPIDOTUS *Cuv.* Body with a few longitudinal bands of small scales under the common skin, the interstices of which are naked ; dorsal fins more or less united at their base ; ventrals of three rays, nearly as long as the pectorals.

*H. Tilesii.** *Cuv.* and *Val.* iv. 276. pl. 87.

* The species figured by Tilesius, which M. Cuvier quotes as the same as

FAMILY 5. AGONIDÆ. *Mailed Bullheads.*

Body angulated, generally long and slender, resembling the Pipe-fish or Syngnathidæ, covered with mailed plates; jaws prolonged, somewhat tubular; vomer without teeth; ventral fins very small, of two rays.

Aspidophorus Lac. Body ovate, oblong; head thick, depressed, rather broad; the tip of the muzzle somewhat recurved, and armed with two spines; mouth beneath, lower jaw shortest, with numerous slender cirri; dorsal fins two, united at the base; tail suddenly attenuated.

A. Europæus. Yarr. i. 70. Bloch, pl. 39.

AGONUS *Bl., Tilesius*. Head narrower; body linear, very long; snout without spines; mouth terminal, opening vertically; dorsal fins united; ventral of two rays.

A. dodecaedrus. Til. Petersb. Tr. iv. pl. 13.	lævigatus. Til. Petersb. Tr. ii. pl. 14.
rostratus. Ib. iv. pl. 14.	Senegalensis. Griff. pl. 53. fig. 1.

HIPPOCEPHALUS *Sw*. Body shorter, irregularly ovate; head small; the nape much contracted; dorsal fins two, remote, the first with strong spines; caudal ovate, rounded; three rows of spinal processes on the sides.

superciliosus. Pall. Sp. Zool. vii. pl. 5.	decagonus. Schn. pl. 27.
	quadricornis. Cuv. pl. 80.

CANTHIRYNCHUS *Sw*. Body very long, linear; dorsal fin single, small, placed in the middle of the back, above the anal fin; snout short, armed with two spines; mouth terminal; plates on the body smooth; ventral fins small, of three rays.

C. monopterygius. Cuv. and Val. pl. 169.

his *H. Tilesii*, appears to me different; the first has only three rays to the ventral, whereas the species figured by Cuvier is represented with five in his plate 85.

FAMILY 6. BLENNIDÆ. *Blennies.*

Ventral fins very slender, thick, of not more than two or three cylindrical rays*, enveloped in the common skin; head thick, fat, obtuse; lips thick, fleshy; anterior dorsal rays slender, flexible.

1. SUBFAM. BLENNINÆ.

Dorsal fin with a few spinous and many soft rays.

BLENNIUS Linn. Mouth small, all the teeth long, conic, equal, and compact, placed in a single row, and generally with a canine tooth on each side.

Blennius proper. (*fig. 81.*) Dorsal fin generally deeply emarginate, or cleft in the middle, having a palmated or fimbriated membranaceous crest over the eyes; head thick, obtuse; snout truncate; mouth very small.

B. ocellatus. Bloch, pl. 167, fig. 1.

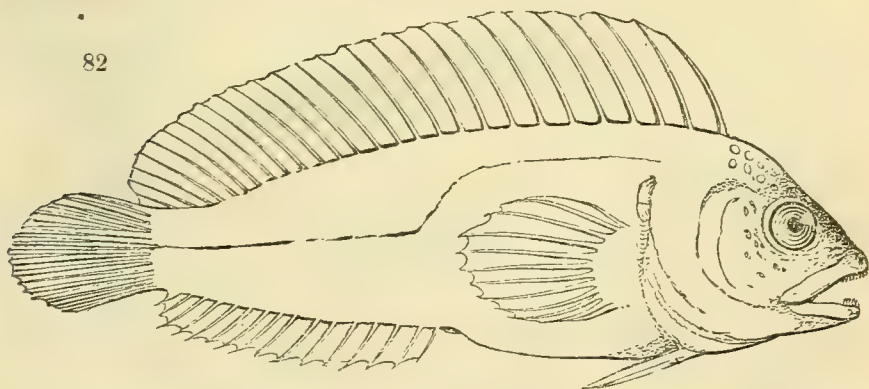
Pholis Artedi. Resembling the last, but the dorsal fin very slightly emarginate; no crests.

P. Smyrnensis. Cuv. pl. 325.

Chasmodes Cuv. (*fig. 81.*) Crested, resembling *Blennius*; but the head is



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more prolonged; the mouth large; and the dorsal and

* Excepting *Opistognathus*.

anal fins united to the caudal; branchial aperture very small, spiraculated.

C. Boscianus. Cuv. pl. 327. (*fig. 82.*)

Blenitrachus Nob. Head large, prolonged, as in the last, but the lower jaw is longest, the mouth obliquely vertical; the dorsal fin narrow and equal, and not united to the caudal; a strong canine in the lower jaw; branchial aperture spiraculated.

Omobranchus Ehrenberg.* Head obtuse, mouth small, as in *Blennius*; branchial orifice above the base of the pectoral; dorsal fin undivided; crests generally wanting; canine teeth very large.

filamentosus. Cuv. xi. 280.

punctatus. Cuv. xi. 286.

Dussumeri. Ib. 282.

fasciolatus. Ehrenb. Ib. 287.

breviceps. Ib. 283.

anolius. Ib. 288.

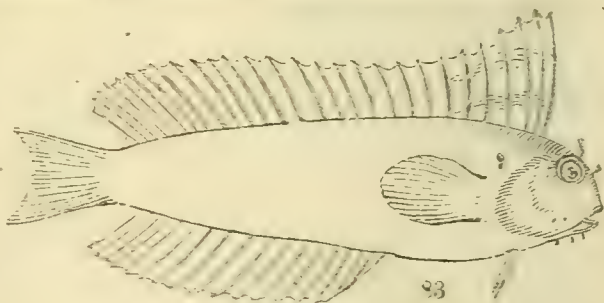
grammistes. Ib. 284.

biocellatus. Ib. 289.

cyprinoides. Ib. 286.

SALARIAS Cuv. Numerous setaceous teeth, very fine, delicate, and flexible at their roots; with or without canine teeth; head with crests.

Petroscirtes Rüppell. (*fig. 83.*) Dorsal fin broad, undivided, elevated in front; branchial spiracle as in *Omobranchus*; a "single series of small setaceous teeth."—



Rüppell.

P. mitratus. Rüpp. Atl. 28.
f. 1.

ancylodon. Ib. Neue W.
pl. 1. f. 1.

Salarias Cuv. Muzzle short, truncate; dorsal fin high, deeply cleft; canine teeth generally present.

vermicularis. Cuv. xi. 296.

percophthalmus. Ib. pl. 328.

* Subsequently called *Blennechis* Cuv. and Val., and made to include *Petroscirtes*.

Erpicthys Nob. Dorsal fin slightly or not at all emarginate ; canine teeth generally wanting.

Atlanticus. Cuv. xi. 322.	niger. Cuv. xi.
quadripinnis. Rüpp. 28. 2.	frontalis. Ib. 328.
Sebæ. Ib. p. 323.	ruficauda. Ib. 328.
castaneus. Ib. 324.	quadricornis. Ib. 329.
fasciatus. Ib. 324.	variolatus? Ib. 346.
cyclops. Ib. 32.	frænatus. Ib. 342.

Rupiscartes Nob. Body anguilliform ; dorsal low, subdivided ; caudal fin not attached to the dorsal ; ventral fins perfect, of three soft rays, and one spinous, fully developed ; mouth oblique, directed downwards.

R. Alticus. C. V. xi. 337.*

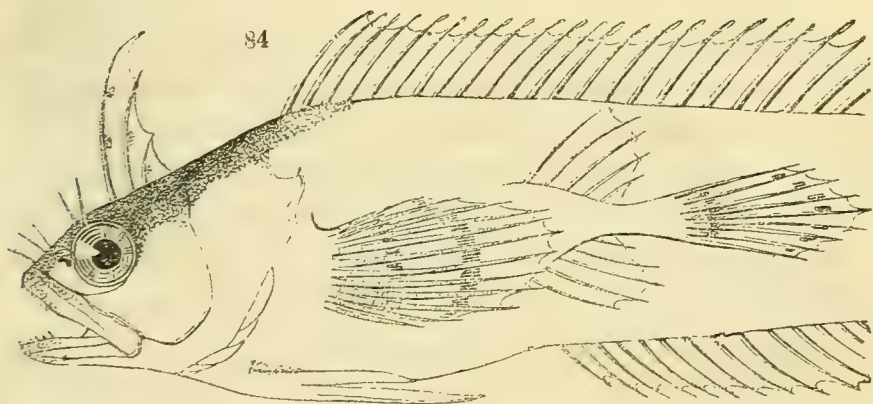
Cirripectes Nob. Body short ; profile vertical ; a semicircle of filaments round the nape ; head crested ; dorsal high, and cleft in the middle ; representing *Cirribarbus*.

C. variolosus. C. V. xi. 317.

CHIROLOPHIS† Nob. Body anguilliform, much compressed ; head crested, obtuse, profile rounded ; teeth as in *Blennius*, but smaller and shorter ; mouth oblique, rather wide ; dorsal and anal fins of equal breadth throughout ; the former attached to the caudal ; ventrals very short, of three rays.

C. Yarrellii. C. V. xi. 218.

CRISTICEPS Cuv. Profile nearly ovate ; dorsal fins two,



* More than one species appears to be placed under this name ; this type evidently represents, or passes into, *Opistognathus* ; not having seen it, I have followed M. Valenciennes in retaining it for the present in this genus : it is said to jump on the sea rocks like a lizard.

† I have but little doubt of this being a sub-generic type, representing the *Gunnell* *Blennies*, but its precise situation requires much investigation.

the first placed on the occiput, like a crest, and of three rays ; the second remote and detached from the tail.

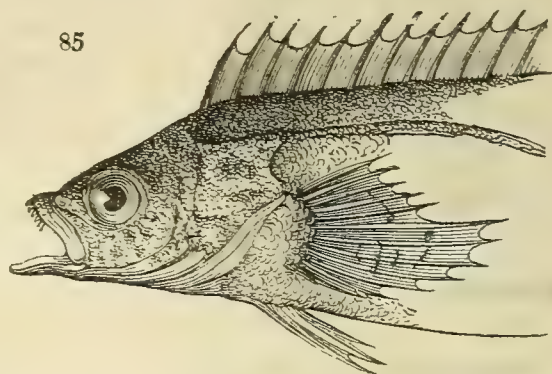
C. australis. C. V. xi. 403. pl. 336. (*fig. 84.*)

MYXODES *Cuvier.*

85

Head elongated ;
muzzle pointed,
projecting beyond
then Blen-
teeth as in *can-*
nius, but
nines.

M. ocellatus. C.
V. pl. 335.
(*fig. 85.*)



2. SUBFAM. CLININÆ.

Dorsal fin with many spinous and few soft rays.

TRIPTERIGION *Risso.* Dorsal fins three ; head somewhat produced.

T. nasus. C. V. xi. p. 409. pl. 338.

CLINETRACHUS *Nob.* Chironectiform ; head somewhat pointed ; mouth obliquely vertical, opening downwards ; dorsal fins two, low, the first triangular, of three rays.

superciliosus. Bl. pl. 168. *perspicillatus*. C. V. xi. 372.

BLENNOPHIS *Nob.* Oviparous, anguilliform ; body lengthened, sub-cylindrical ; dorsal and anal fins low and equal ; profile nearly rectilinear ; head crested ; teeth velvet-like, the exterior strongest ; dorsal fin attached to the caudal, which is rounded ; ventrals of three rays, nearly as long as the pectorals.

anguillaris. (Clinus, do. C. V. xi. 390.)

variabilis. Raff. (1810.) (Clinus. *argentatus*. C. V. xi. 354.)

CLINUS *Cuv.* Teeth velvety, those in the front row scarcely, if at all, larger than the others ; body ovate ; dorsal fin of nearly equal breadth throughout.

acuminatus. Cuv. xi. *cottoïdes*. Ib. 368.

LABRISOMUS *Nob.* Front row of the teeth strong, conic, and pointed, the hinder velvety; body thicker than in *Clinus*; dorsal fin distinctly emarginate towards the caudal.

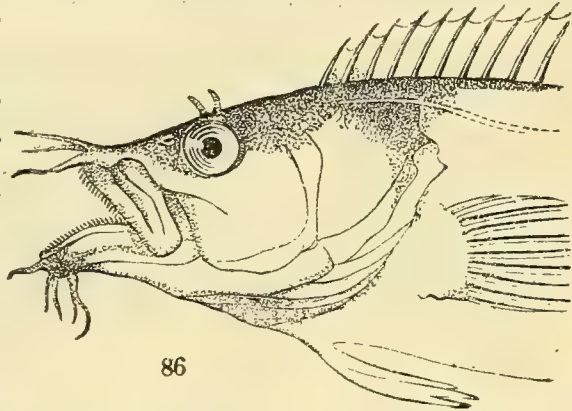
L. gobio. C. V. xi. 395.
pectinifer. Ib. 374.
capillatus. Ib. 377.
Delalandii. Ib. 378.
linearis. Ib. 371.
variolosus. Ib. 381.

Peruvianus C. V. xi. 383.
microcirrhis. Ib. 384.
 ? *geniguttatus.* Ib. 86.
elegans. Ib. 388.
 ? *littoreus.* Ib. 389.
latipennis. Ib. 394.

OPHISOMUS* *Nob.* Anguilliform, compressed, ventral fins excessively small, generally of one ray; dorsal fins entirely spinous.†

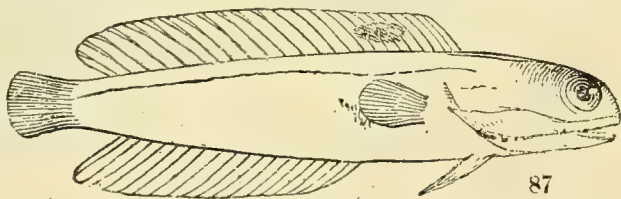
O. gunnellus (*Blennius gunnellus.* Lin.) Yarrell. i. 239.

CIRRIBARBUS *Cuv.* (*fig. 86.*) Head and mouth with numerous cirri; body sub-anguilliform; muzzle pointed; lower jaw longer than the upper; teeth velvety, the outer range a little larger; ventral fin of two rays; dorsal fin single, narrow, of nearly equal breadth; spinous, with a few soft rays behind.



Cirr. capensis. C. V. xi. 406. pl. 337. (*fig. 86.*)

OPISTOGNATHUS *Cuv.*‡ (*fig. 87.*) General form of *Salaria*; head large, thick, very obtuse; eyes and maxillaries



* *Gunnellus* Auct. "Nomina generica quæ ex Græca vel Latina lingua radicem non habent, rejicienda sunt."—*Illiger, Prod.* xvii.

† This and the two next genera appear to represent the three aberrant sub-families, *Ophisomus* passing into the *Zoarchinidæ*.

‡ The prolongation of the maxillaries renders this a beautiful representation of *Thyrssa*. These three last genera seem to represent subfamilies.

very large ; the latter prolonged behind into a sort of flat moustache ; ventral fins with three external rays.

Sonneratti. Cuv. and Val.
xi. 495.

nigromarginatus. Rüpp.
Atl. 28. 4. * (fig. 87.)

FAMILY 7. GOBIDÆ. *Gobies*.

Ventral fins perfect, very close, and generally united, of several branched rays.

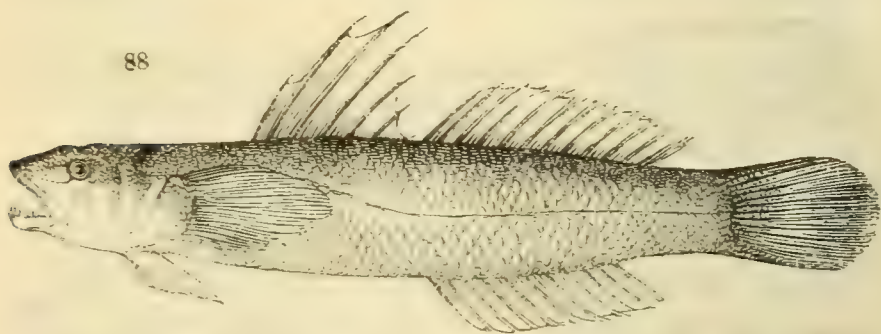
1. SUBFAM. GOBIANÆ.

Body slimy ; the head large and depressed ; the sides fat and gibbous ; ventral fins entirely united into a funnel ; dorsal rays setaceous and flexible ; eyes approximating ; size small.

GOBIUS proper. Caudal fin rounded, rarely lanceolate ; ventral fins completely united into a concave disk ; dorsal fins two, distinct ; lower jaw longest ; Europe.

G. niger Auct. Jozzo. Bl. pl. 107. fig. 3.

Sicydium Val. Resembling Gobius, but the ventral fins adhere almost equally on all sides, so as to form a basin ; jaws with a range of flexible, equal, serrated teeth.



S. cyanocephalum. Cuv. Val. xii. pl. 352. (fig. 88.)

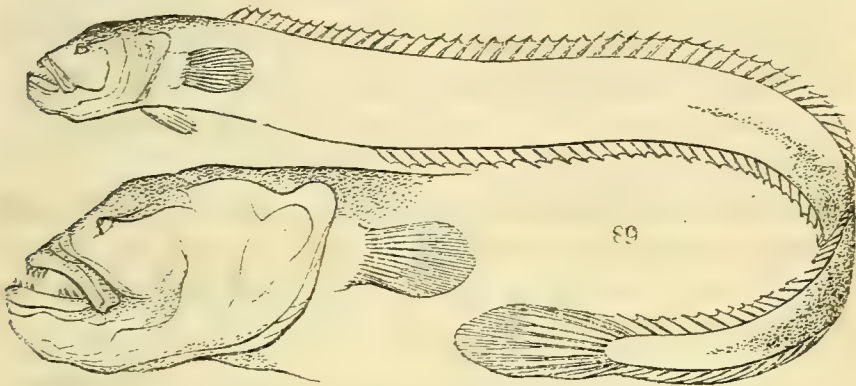
OGNICHODES Sw. Habit of the last, but the dorsal

* Distinguished from *Sonneratti*, according to Rüppell, by having four instead of three external rays to the ventrals ; a character which appears to me of the highest importance. M. Rüppell also states the gill membrane to be of three rays only, whereas that of the former is stated to be six.

fin is single, narrow, and extends the whole length of the body, which is much more lengthened.

G. Broussonetii. Griff. Cuv. pl. 38. fig. 2.

TRYPAUCHENA *Cuv.* Body anguilliform ; dorsal fins single, narrow, and united to the caudal, which is short and rounded ; branchial opening very narrow ; under jaw longest ; eyes minute.



T. vagina. Cuv. Val. xii. pl. 351. (*fig. 89.*)

AMBLIOPUS *Cuv.** Body anguilliform ; dorsal, anal, and caudal fins united, the latter very long and lanceolate ; all the rays soft and branched ; mouth nearly vertical ; lower jaw longest, with a few long, distant, curved teeth ; eyes very minute, and almost hid in the skin ; India.



rubicunda. Hamilt. pl. 5. 9. Hermannianus. Cuv. (*fig. 90.*)

SCARTELAOS *Sw.* Body long, eel-like, destitute of scales ; dorsal fins two, the second and anal very long, but not united to the caudal, which is large and

* Since the Synopsis was printed, where this type is called *Psilosoma* the 12th vol. of Cuvier and Valenciennes's work has appeared, where it is named *Amblyopus*.

lanceolate ; pectorals with their base neither pedunculated nor scaled.

Sc. viridis. Ham. pl. 32. fig. 12. *chrysophthalmus*. Ib. pl. 37.
calliurus, Ib. pl. 5. fig. 10. fig. 10.

PERIOPHTHALMUS *Sch.* General form of *Scartelaos*, but covered with scales ; dorsal fins two, remote ; the first high and very short ; pectoral fins with a pedunculated base, covered with scales ; eyes small, very close, with a lid at their inferior edge, and capable of being elevated ; gill aperture remarkably small ; ventral fins sometimes slightly divided ; caudal obliquely oval, obtuse.

Plinianus. Hamilt. pl. 13. 13. *Freycinettii*. Griff. pl. 38.
9-radiatus. Ib. pl. 2. fig. 14. fig. 3.
7-radiatus. Ib. p. 46. *Ichlosseri*. Pall. Spec. pl. 1.
13-radiatus. Ib. p. 48. fig. 1—4.

2. SUBFAM. CALLIONYMINÆ.

Head and body depressed ; ventrals distinct, very large.

CALLIONYMUS *Linn.* Branchial aperture very small, as in the eel ; gill-covers elongated and spined ; head very much depressed ; eyes approximating ; operculum armed with a prominent bony spine, often cuspidate ; ventral fins very large, distinct, and placed before the pectorals, which are smaller ; dorsal fins two, sometimes much elevated ; mouth small, protractile ; jaws with small crowded teeth.

C. lyra. Bloch, pl. 161.

Platyptera K. and Van H. Habit of *Callionymus* ; dorsal fins two, distinct ; ventral fins broad and distinct ; branchial aperture wide ; mouth small ; scales broad ; head short, depressed. India.

P. melonacephala K. H. *trigonocephala*. K. H.

Trichonotus *Sch.* Resembling the last ; but the dorsal fin is single, and corresponds to the anal, which is long ; the two first rays of the dorsal are extended into long bristles ; the branchial aperture large.

T. setigeris. Bl. Schneider, pl. 39.

3. SUBFAM. ELEOTRINÆ.

General character of the last, but the ventrals are not united, and the shortest rays are in front.

ASTEROPTERYX Rüppell. Small, ovate, fusiform, compressed; scales large, crenated; dorsal fins two, the first very high and falcate; ventral fins very long; the outer rays (?) the longest; mouth horizontal, moderate, with a single row of conic teeth; no lateral line or anal appendage; head compressed, covered with scales.

A. semipunctatus. Rüpp. Atl. i. pl. 34. fig. 4.

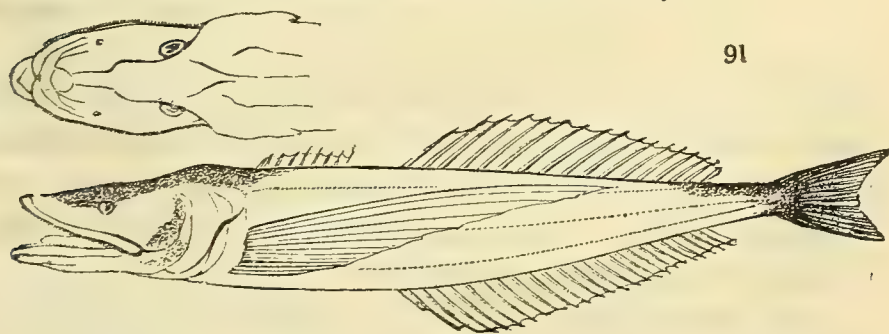
ELEOTRIS Gronov. General structure of *Gobius*; but the ventral fins moderate; dorsal fins two, the first with flexible spines; eyes remote.

Siculus. Sw. App. *niger.* Frey. Atl. pl. 60. fig. 2.*

RUPELLIA Sw. General habit of *Gobius*; ventral fins united; head thick, fat, obtuse, covered with fleshy cirri or filaments; eyes vertical; lower jaw directed upwards, and longer than the upper; mouth vertical; representing *Uranoscopus*, &c.

R. echinocephala. Rüpp. Atl. i. pl. 34. fig. 3.

COMEPHORUS Lac. Dorsal fins two; ventrals wanting; muzzle oblong, broad, and depressed; pectorals very long; gill opening large, with seven rays.



C. Baicalensis. Pall. Nov. Act. i. ix. fig. 1. (fig. 91.)

* If the *Sciæna macrolepidota* and *maculata* of Bloch, pl. 298, 299, fig. 2, placed here by Cuvier, are correctly represented, they do not, I think, belong to this genus; because the ventral fins are drawn as in ordinary fishes, that is, with the longest rays in front, whereas, in *Eleotris*, those in front are the shortest.

FAMILY 8. BATRACHIDÆ. *Blenny Bullheads.*

Head broader than the body, obtuse, depressed, fleshy, with slender appendages or cirri, and a few concealed prickles on the gills, but without distinct spines or bony tubercles; scales small, regular, but sometimes embedded in the skin, and not visible externally; pectorals broad, obtuse, not pedunculated; branchial aperture narrow or spiraculated; ventral fins very small, with two to three round rays; all the fins enveloped in the common skin of the body; operculum with a few small concealed prickles; mouth wide, but not vertical; caudal rounded.*

BATRACHUS *Lac.* Head broader than the body, which is covered with minute scales and short slender cirri; dorsal fins two; the first short, triangular, and spinous; ventral fins thick, two-rayed.

Dussumieri. Cuv. pl. 367.

AMPHICHTHYS *Sw.* Body without visible scales; dorsal fin single; ventral fin pointed, of two thick and short rays; in each jaw a single row of teeth, irregular in size, straggling, and very obtuse, those at the tip of the lower jaw sharp and incurved.

rubigenes. Sw. Appendix.

FAMILY 9. CHIRIDÆ.

All the dorsal rays slender; body compressed, with ventrals distinct; several lateral lines formed of series of pores on the sides.

CHIRUS *Steller.* Body rather lengthened; scales ciliated; head small, unarmed; mouth slightly cleft; teeth small, unequal, conical; dorsal fin single, extending the whole length of the back; the spines very

* This definition will separate this group from those which, from having the pectorals pedunculated, are arranged with the *Lophidæ*: there is, indeed, a strong resemblance between the two, but this is at once explained by the analogous representation they give of each other. They all, however, require a thorough revision.

delicate ; sides of the body with several rows of pores ; head crested, as in *Blennius* ; ventral fins distinct, of five soft rays.

L. lagocephalus. Pall. Mem. Ac. Pet. xi. 1810.

FAMILY 10. ZOARCHIDÆ.

Anguilliform ; dorsal, caudal, and anal fins united ; the rays soft.

ZOARCHUS *Cuv.* Ventral fins very small, nearly obsolete, of three rays ; jaws with a single row of conical teeth, and several in front ; but none on the palate.

Z. viviparus. Bl. pl. 72.

*ANARRHICHAS** *Linn.* No ventral fins ; palate and vomer with strong bony tubercles, and small enamelled teeth ; the cutting teeth, however, are long and pointed ; mouth wide ; body slimy.

A. lupus. Bl. pl. 74. *A? leopardus*. Spix. pl. 51.

ORDER II. MALACOPTERIGES. *Soft-rayed Fishes.*

The rays of the dorsal fin soft, articulated, and branched.

FAMILY 1. SALMONIDÆ. *Salmon.*

Body compressed, symmetrical, covered with scales ; fins naked ; the membrane sub-opaque ; the rays soft.

1. SUBFAM. CYPRINÆ. *The Carps.*

Dorsal fin single, generally in the centre of the back ; mouth small, without teeth, but strong ones are placed in the pharynx ; tongue smooth ; scales generally large.

CYPRINUS *Linn.* Lips moderately thick, but neither plaited nor crenated ; the two first, or anterior dorsal rays spinous, and sometimes serrated.

Cyprinus *Linn.* Jaws of equal length ; the mouth

without barbels or cirri ; the dorsal fin lengthened ; the spines serrated.

C. carpis. Bl. pl. 16.

Barbus. Dorsal fin short, nearly triangular ; the spine sometimes serrated ; the mouth with distinct barbels ; the jaws nearly equal.

B. vulgaris. Bl. pl 18. *intermedius.* Rüpp. Nil. 3. pl. i. f. 2.

Salmophasia Sw. Body lengthened ; lips rather thin ; mouth wide ; the jaws equal ; the lip of the upper recurved ; dorsal fins small, placed near the caudal, and just above the anal, which latter is lengthened ; ventral fin very small, central, with a lanceolate appendage ; pectoral fin large, pointed.

oblonga. Sw. Ham. fig. 76. *elongata.* Gray. Ind. Zool. (*Cyp. bacaila*). (*Cyp. cora*).

CATASTOMUS. Lips very thick, tuberculated, plaited, or crenated ; dorsal spines simple, without serratures.

Labio Cuv. Lips crenated ; lower jaw shortest ; barbels or cirri either very short or wanting ; dorsal and ventral generally long.

L. filamentosus. Sw. Ham. fig. 84. (*Nandina*).

Labiobarbus Rüpp. Lips excessively thick, the under one short, fleshy, and hanging downward ; upper lip with barbels ; anal fin largest.

L. nidgia. Rüpp. Nil. 3. pl. 2. f. 3.

Catastomus Le Sueur. Both lips very thick, and plaited, the lower hanging downwards ; mouth very small, placed beneath the snout ; cirri or barbels entirely wanting ; anal fin without a lanceolate appendage * at the base.

C. communis Le Sueur. Am.

Bostonienses. Ib. pl. 24.

Tr. i. pl. 25.

aureolus. Ib. pl. 23.

gibbosus. Ib. i. pl. 29.

Aberrant.

macrolepidotus. Ib. pl. 30.

cyprinus. Ib. pl. 26.

Dusquesnii. Ib. 27.

elongatus. Ib. 28.

* This process, common to the Indian type, is neither mentioned nor delineated by Le Sueur as existing in any of those here quoted from his paper on this genus.

Chedrus Sw. Jaws equal ; lips tuberculated ; dorsal fin placed very near to the caudal.

C. Grayii. Sw. Gray, Ind. Zool. pl. 2. f. 3.

LEUCISCUS Klein. Lips generally thin, never crenated ; dorsal and anal fins without spines.

Chela Ham. Mouth small, opening vertically ; dorsal fin placed close to the caudal ; ventral fins with the first ray considerably lengthened ; anal fin very long.

C. anastoma. Gray, Ind. Zool.

Esomus Sw. Cirri considerably developed, longer than the head ; dorsal fin placed near the caudal, and opposite to the anal ; ventral fin central ; lower jaw longest ; mouth obliquely vertical.

E. vittatus. Sw. Ham. f. 88. (*Daurua*).

Leuciscus Klein. *Bleaks.* Dorsal fin central, placed intermediate between the ventral and anal ; mouth destitute of cirri ; caudal deeply forked.

L. alburnus. Bl. pl. 8. f. 4. *cæruleus.* Yarr. i. 365.
phoxinus. Ib. pl. 8. f. 5. *lancastrensis.* Ib. i. 355.
erythrophthalmus. Ib. pl. 1.

Tinca Willoughby. *Tench.* Mouth small ; lips rather fleshy ; dorsal fins central, placed just above the ventral ; cirri small, or wanting.

T. leuciscus. Bl. pl. 97. *rutilus.* Bl. pl. 2.
cephalus. Ib. pl. 6. *dobula.* Ib. pl. 5.
communis. Ib. pl. 14. *gobio* Linn. Ib. pl. 8. f. 2.
idus. Ib. 36.

Abramis Cuv. *Breams.* Resembles the last, but the body is broader, and the anal fin is much lengthened ; caudal fin large, deeply forked.

Brama. Bl. pl. 13. *Gangeticus.* Ham. f. 93.

GONORHYNCHUS Gron. Body linear, elongated ; head rather lengthened, and both covered with scales ; mouth small, without teeth ; placed beneath the muzzle, which is much advanced ; lower jaw considerably shorter ; dorsal fin placed near the caudal, and just above the ventral.

G. capensis. Gron. Zoop. pl. 10. f. 2.

ERYTHRINUS *Gronovius*. Body oblong, sub-cylindrical, or very slightly compressed; the scales large and strong, but deciduous; head round, obtuse; the bones of great hardness, but without scales, those on the cheeks rough; mouth very large; jaws armed with a row of formidable conic teeth, alternately small and large, while others on the palate, &c. are numerous and small; dorsal fin single, central, quadrangular; ventral placed beneath it; pectoral and anal of equal size, and ovate; caudal broad and rounded: rivers of Tropical America: representing Saurus among the freshwater fishes.

E. salvus. Agass. Pis. Braz.	microcephalus. Agass. Ib.
p. 41.	pl. 44.
unitæniatus <i>Spix</i> . Ib. pl. 19.	Braziliensis. <i>Spix</i> , pl. 20.
macrodon. Agass. Ib. pl. 18.	

Synodus* *Gronov*. General form and structure of *Laurida*, but there is no second adipose dorsal; ventral fin moderate, placed beneath the dorsal.

S. Gronovianus. Sw. Gro. Zoop. pl. 7.. f. 1.

2. SUBFAM. SALMONINÆ. *Salmon*.

Dorsal fins two †, the second adipose; body with compact scales; jaws generally well furnished with teeth.

SUDIS *Cuv*. Body lengthened, cylindrical, somewhat anguilliform, covered with very large osseous scales; head depressed, naked; the plates bony and corrugated; mouth large, transverse; eyes placed near the crown; teeth strong, acute; dorsal fin long, placed close to the caudal, and above the anal; ventral very small, nearest the caudal; anal half the length of the dorsal; caudal small, round.

S. gigas *Cuv*. *Spix*, pl. 16.

Clupisudis *Sw*. Mouth and teeth small; anal fin longer

* M. Cuvier has rejected this genus altogether, because he believes that the specimen upon which Gronovius founded the genus, and from which his figure is taken, is but a *Salmosaurus*.

† Except in *Sudis*, which, from the backward position of its dorsal fin, may possibly belong to the *Esocinæ*, or pikes.

than the dorsal ; ventral fin nearest the head ; vent central.

C. niloticus. Rüpp. Fish of the Nile, i. pl. 3. f. 2.

SALMO Linn. All the internal parts of the mouth armed with small teeth ; gill-membrane of seven rays ; body lengthened, fusiform ; the belly never serrated ; mouth usually cleft beyond the eyes.

Mallotus Cuv. Body linear, rather lengthened ; lower jaw longest ; teeth on the jaws, palate, and tongue ; pectoral fins rounded ; caudal forked ; ventral fin nearly central, placed beneath the first dorsal ; anal fin lengthened.

M. Grœnlandicus. Bl. 381. f. 1.

*Coregonus** Artedi. Body ovate, lanceolate ; head and mouth small, the latter not cleft to the eye ; the aperture oblique ; teeth minute, sometimes wanting ; ventral fin beneath the dorsal.

C. maræna. Bl. 27. *C. marænula*. Jard. i. 3. pl. 1.

Argentina Linn. Body semi-transparent ; mouth small, transverse ; tongue and vomer furnished with teeth ; those on the former stronger, and hooked ; gills six-rayed.

A. sphyræna Linn.

Salmo Linn. Body ovate, lanceolate ; mouth horizontally cleft ; the lower jaw, in the males, curved upwards ; jaws, and all the interior parts of the mouth, armed with pointed teeth ; angle of the mouth extending even to, or behind, the eye ; ventral fin rather behind the anterior base of the first dorsal.

Salmo solar. Bl. pl. 20. *eperlanus*. Bl. 28. f. 2.

Laurida Arist. Body rather linear, cylindrical, covered with hard and sometimes carinated scales ; mouth enormous, cleft far behind the eyes, which are small, sub-vertical, and placed close to the tip of the snout ;

* Will not several of the Brazilian salmon, as *Anodus* Spix, &c., belong to this group ?

teeth numerous, remote, slender, acute, and of unequal lengths ; ventral fins very large ; pectorals small.

L. *Mediterranea* Sw. (Vol. I. p. 246. fig. 48.) semifasciata. Bl. 384. f. 1.
 p. 246. fig. 48.) conirostra. Spix, pl. 43.
 foetans. Bl. 384. f. 2. intermedia. Ib. 44.
 tumbel. Ib. 430. minuta Le Sueur. (Vol. I.
 truncata. Spix, pl. 45. p. 247. fig. 50.).

Triurus Sw. General habit of *Laurida* ; body semi-transparent ; eyes very small ; head serpent-like ; pectorals large and falcate ; caudal ending in three points.

T. *microcephalus*. Russell, pl. 171.

Harpadon Le Sueur. Resembling *Laurida* and *Triurus*, but some of the teeth are barbed at their points ; the ventral fin is immediately under the pectoral, which latter is moderately large and pointed ; caudal lunate.

H. *microps* Le Sueur (Vol. I. fig. 49.)

*Aulopus** Cuv. ? Body somewhat lengthened ; eyes very large ; head, before the eyes, bony ; the sides and the body covered with large scales ; mouth wide, oblique ; lower jaw longest, margined by a row of very small equal acute teeth directed backwards ; first dorsal fin central, large, high, falcate, lowest in the middle ; the two first rays very long, and ending in filaments ; adipose dorsal above the anal ; ventral fin large, commencing just behind the pectoral, and on a line with the dorsal ; tail deeply forked, the basal half covered with minute scales ; pectoral small.

Aulopus filamentosus.†

CHARACINUS *Artedi*. Tongue smooth ; mouth small short, obtuse, cleft obliquely ; the upper jaw often sinuated in the middle ; gill-membrane four, rarely five, rayed ; body generally short, broad ; the belly

* I suspect that this, with the foregoing sub-genera *Laurida*, *Triurus*, and *Harpadon*, may constitute a natural group of higher value than what they now appear: if *Sudis* really belongs to the *Esocinae*, then the *Laurinae* may occupy its station in the sub-family of *Salmoninae*.

† I think this fish, which I described from a fresh specimen in Sicily, is the *Aulopus* of Cuvier, but his description is not sufficiently explicit. It certainly has an analogy to, but has none of the true characters of, *Gadus*.

mostly carinated, and sometimes serrated. Rivers of America.

Cynodon Spix. Mouth enormously large, oblique ; both jaws armed with sharp, distinct, and unequal teeth ; first dorsal fin placed more or less backward, and opposite to the commencement of the anal, which is very long ; ventral fin minute ; eyes close to the top of the muzzle ; lower jaw longest.

C. gibbus. Spix and Agass. pl. 27. *vulpinus*. Ib. 27.

CHARACINUS *Artedi*. † Body oblong-ovate ; head obtuse ; upper jaw sinuated in the middle on each side ; the lower weaker, and both with the palate armed, by pointed or tricuspidate teeth ; belly smooth ; first dorsal fin central ; scales large.

C. gibbosus. Gronov. pl. 1. fig. 4. *Amazonicus*. Spix, pl. 35.

Anodus Spix. Body more slender ; resembling the last, but the mouth is without teeth.

A. elongatus. Sp. and Ag. pl. 40. *macrophthalmus*, Bl. 380.
latior. Ib. pl. 41. (*Salmo edentatus* Bl.)

* Lips fleshy. *Prochilosus* Agassiz.

P. argenteus. Spix, pl. 38. *nigricans*. Ib. 39.

Curimatus Cuv. General aspect of *Anodus* ; but the upper jaw is not sinuated, and in both there is a single row of teeth, either simple or bifid.

C. fasciatus. Bl. 379. *leporinus*. Spix, pl. 37.

Spixii Sw. Spix, pl. 36. (*Leporinus 9-fasciatus* Spix.)

Serrasalmo Lac. Body short, broad, thick, somewhat rhomboid ; head, mouth, and fins as in *Characinus* ; but the under jaw is much thicker, the teeth stronger, and the belly serrated, in front of which there is generally a short spine ; first dorsal fin between the ventral and anal ; the latter lengthened.

S. aureus. Spix, pl. 29. *ferox* Sw. Spix, pl. 28.

nigricans. Ib. 30. *bidens*. Ib. pl. 32.

Tetragonopterus *Artedi*. Resembling *Serrasalmo* in all

† Connected to *Cynodon gibbus* by *Characinus gibbosus* Sw.

but having the first dorsal immediately above the ventrals, and the belly sometimes smooth.

T. aureus. Spix, pl. 31. *chalceus*. Ib. pl. 33. f. 1.

Gasteropelicus Bl. Head and mouth directed upwards ; body compressed, very broad at the belly, which is sharp ; the first dorsal short, triangular, placed half-way between the pectoral and the caudal ; anal fin long ; ventral very small, close to the anal ; tail forked ; teeth strong : representing *Pristogaster*.

G. sterniela. Bloch, pl. 97. f. 3.

Chalceus Spix.* Body elongated from the pectoral fin, which is considerably lengthened and pointed ; mouth, teeth, and the situation of the first dorsal as in *Serrasalmus* ; belly prominent, smooth.

C. angulatus. Spix and Agass. pl. 34.

Piabucus Cuv. Body oblong, lanceolate ; belly carinated ; mouth small ; teeth minute ; nostrils single ; pectoral fins rather lengthened, pointed ; first dorsal intermediate between the ventral and anal ; the latter very long.

P. argentinus. Bl. 382. f. 1. *bimaculatus*. Bl. 382. f. 2.

unimaculatus. Ib. 381. f. 3. *melanurus*. Ib. 381. f. 2.

Xiphostomus Spix. Body oblong, lanceolate ; jaws more or less lengthened ; the upper considerably angulated towards the gape, and both armed with sharp unequal teeth.

Hydrocyon Cuv. Resembling *Piabucus* in its fins ; but the jaws are produced, the upper strongly angulated, and both furnished with acute unequal teeth ; the mouth is cleft in an horizontal direction, as in the true salmons ; anal fin very long.

H. falcatus. Bl. 385.

Xiphostoma Spix. Body nearly linear ; scales hard, carinated ; jaws considerably prolonged and pointed, the upper one longest ; anal fin short, triangular ;

* I introduce this supposed type from having previously mentioned it, but it appears to me to be no other than an aberrant species of *Piabucus*, connecting this latter with *Gasteropelicus*.

ventral fin rather before the first dorsal ; jaws margined by a row of small, equal, and acute teeth pointing backwards ; caudal lunate.

X. *Cuvierii*. Spix and Agass. pl. 42.

MORMYRYNCHUS *Sw.* Cuv.* Body ovate ; the head and snout considerably produced and narrowed ; mouth terminal, very small, opening in a vertical direction, and remote from the eyes ; chin protuberant and terminal ; first dorsal fin central, placed between the pectoral and ventral.

M. *Gronoveii Sw.* Gronov. Zooph. pl. 7. f. 2.

STERNOPTYX *Herm.* Body short, broad, excessively thin and sub-pellucid ; head and eyes very large ; mouth deep, vertical ; ventral fins nearly obsolete, with a spine in front ; dorsal single, in the middle of the back, with an osseous crest in front ; anal fin long.

S. *Hermanniana*. Cuv. Rege An. pl. 13. f. 1.

3. SUBFAM. CLUPINÆ. *Herrings.*

Dorsal fin single, central ; mouth small, oblique ; lips very thin ; teeth minute, or none ; body compressed ; aperture of the gills very large ; scales large, deciduous.

OSTEOGLOSSUM. Ventral fin long, united to the caudal.

Osteoglossum *Vaudel.* Body oblong, linear, greatly compressed ; mouth excessively large, obliquely vertical, armed with numerous small, acute, and equal teeth ; chin with two cirri : eyes close to the snout ; dorsal fin slightly separated (?) from the caudal and anal, which are united ; tongue osseous, covered with small, straight, and truncated teeth.

O. *bicirrhosum*. Spix and Agass. pl. 25.

Notopterus *Lac.* Ventral fins minute ; anal very long, united to the caudal, and occupying three-fourths of the length of the body ; dorsal fin small, nearly cen-

* This is the *Anastomus* of Cuv. ; but that name had been previously bestowed by Lamarck upon a well-known genus of land shells ; the similarity of the mouth to that of *Mormyrus* induces me to suggest the above name.

tral, and placed beneath the anal ; gill-membrane of a single strong osseous ray.

N. cynurus. Schn. pl. 426.

Trichosoma Sw. Ventral fin large, placed beneath the dorsal ; pectoral very small, placed immediately beneath a fascicle of six detached setiform processes, which are greatly lengthened ; tail considerably longer than the body, margined beneath by a long narrow anal fin, which unites to the base of the caudal ; belly serrated ; head and mouth as in *Engraulis*.

Tr. Hamiltonii. Gray, Ind. Zool. i. pl. 85. f. 3.

Elops. Jaws and palate provided with distinct teeth, or with tooth-like processes on the edges of the maxillaries.

Setipinna Sw. Pectoral fins large, the first ray extended into a very long naked filament ; belly very short, serrated ; ventrals small ; tail very long, bordered beneath by the ventral fin, which terminates just before the base of the caudal ; dorsal nearest the head ; caudal forked ; mouth excessively wide, opening rather vertically as in *Osteoglossum* ; eyes close to the snout ; jaws margined with small teeth.

truncata Ham. p. 241. *megalura* Sw. Ib. p. 240. f. 72. (*Cl. phasa*.)

Elops Linn. Body oblong, lanceolate, but very little compressed ; belly rounded, smooth ; mouth large, opening horizontally ; jaws, tongue, and palate armed with numerous teeth, which are either sharp or rounded ; dorsal and anal fins short ; ventral placed under the dorsal.

* Palatine teeth sharp. *Elops*.

El. saurus. Bl. 393. f. 1. *Indicus*. Russ. pl. 179.

** Palatine teeth blunt. *Butirinus*.

But. glossodontus. Rüpp. Atl. ii. pl. 30. fig. 3.

Megalops Lac. Mouth small, nearly sub-vertical, as in *Clupea* ; body but slightly compressed ; belly rounded, smooth ; jaws and palate furnished with numerous close-set sharp teeth ; dorsal fin central,

falcate, the last rays prolonged into filaments; anal fin rather lengthened, falcate.

M. cyprinoides. Bl. 403. *filamentosus*. Russ. pl. 203.

Engraulis C. Mouth very large, opening horizontally, and placed beneath the snout, which is rather pointed, and projects over the under jaw; maxillaries considerably prolonged, and armed with acute tooth-like processes at their edges, and often with numerous close-set teeth, both on the jaws and palate*; belly either smooth or serrated; dorsal between the ventral and anal fins.

encrasichlorus. Bl. 302. *albus*. Russ. pl. 187. (*Nattoo*.)

CLUPEA Linn. Mouth small, the teeth almost imperceptible, or entirely wanting; maxillaries short, their extremities broad, and the margin curved; belly always compressed, carinated, and generally serrated.

Thryssa Cuv. General aspect of the anchovy (*Engraulis*), but the body is broader, the mouth enormous, and opening almost vertically; jaws even; eyes placed close to the tip of the muzzle; ventral fin minute; anal fin very long.

Th. megastoma. Russ. ii. *Hamiltonii*. Gray. Ind. Zool. pl. 190. *sub-spinosa*. Ib. pl. 189.

Cuvierii Sw. Ib. pl. 194. *malabaricus*. Bl. 432.

Chatæssus Cuv. Mouth small, without teeth; the upper jaw usually longer than the lower; belly compressed, carinated, and serrated; dorsal fin central; the last ray prolonged into a lengthened filament.

C. nasus. Bl. 439. f. 1.

Clupea Linn. Mouth very small, obliquely vertical; teeth very minute or none; jaws nearly equal, the upper sometimes notched; belly always carinated, and sometimes serrated; dorsal fin placed over the ventral,

* See Russell, ii. pl. 187.

which latter is nearly as large as the pectoral ; anal fin moderate.

C. harengus Bl. pl. 29. f. 1. finta. Yarrell, ii. p. 131.

Leachii. Yarrell, ii. p. 117. communis. Ib. ii. 136.

auro-vittata. Sw. Ap.

Platygaster Sw. General form of the herrings (*Clupea*), but the ventral fins are almost obsolete ; dorsal fin placed between the ventral and anal, which last is very long ; mouth sub-vertical ; belly serrated.

Pl. Africanus. Bl. 407. *parva*. Gray, Ind. Zool. ii.

megalopterus. Russ. pl. 191. pl. f. 3.

affinis. Gray, Ind. Zool. *Indicus*. Russ. pl. 192.

Pristogaster C. Mouth completely vertical ; ventral fin entirely wanting ; belly prominent, carinated, and serrated ; dorsal fin very small ; anal considerably lengthened.

Indicus. Russ. pl. 193. *Martii*. Spix and Agass. pl. 24.

CORICA Ham. Size very small ; general aspect of the herrings ; body diaphanous, brilliant silvery ; the ribs discernible through the integuments ; the bones green ; mouth completely vertical, "descending in a straight line from the extremity of the head ;" jaws without teeth, not protractile ; lips scarcely perceptible ; but two oblong flat bones, hanging perpendicularly, represent the upper lip ; vent behind the middle ; belly carinated and serrated ; anal fins two, the second small, and of about four rays ; dorsal central, placed between the ventral and the first anal.*

C. argentata Sw. Ham. p. 253. (*Soborna*.)

CHIROCENTRUS Cuv. Body compressed, elongated, and naked, or without scales ; the belly sharp or carinated, and "serrated with small fibres;"† mouth

* The above characters are taken from Dr. Hamilton (Gang. Fishes, p. 253.) : the diaphanous structure of this singular fish, its excessive thinness, its vertical mouth, &c., all show its analogy to *Sternoptyr* as a chiro-nectiform type ; but in which of the divisions of the *Clupinæ* it naturally enters, can only, at present, be conjectured.

† The most extraordinary character of this remarkable fish is not noticed by Cuvier. It is the only one in its family that is entirely destitute of scales ;

large, oblique; jaws with a row of strong conic teeth, three on the under jaw, and four * on the upper, remarkably long; dorsal fin short, unequally triangular, placed near the caudal; anal fin long, commencing under the dorsal; ventral fins remarkably small, placed half-way between the pectoral and the anal; pectoral fin large, strong, with a lanceolate process at the base.

C. nudus Sw. Russell, pl. 199.

Hyodon Le Sueur. Body herring-shaped, but broadest towards the tail; belly not carinated†; snout very short, obtuse; mouth moderate; intermaxillaries short, articulated with the maxillaries, and both very narrow; all the inner parts of the mouth furnished with numerous close set unequal conic teeth; dorsal fin near to the caudal; anal fin commencing in a line with it, and long; ventral in the middle.—*Le Sueur*. (See Vol. I. *fig.* 61.)

H. tergisus. Am. Tr. i. 366. *codalis*. Ib. i. 367. pl. 14.

Odontognathus Lac. No ventral fins; body herring-shaped, greatly compressed; the belly sharply carinated, and dentated; anal fin very long and low, more than one half the length of the whole body; dorsal minute, placed near the caudal; maxillaries prolonged a little into a point, and armed with small teeth directed forwards; mouth vertical; affinities and rank uncertain.

O. aculeatus. Lac. ii. pl. 7. f. 2.

and Dr. Russell, who made his description from life, says, that the carinated belly is “serrated with small fibres,” probably broken off or overlooked in Cuvier’s specimen. I cannot possibly believe, also, that Lacepede’s *Esoce chirocentre* is of the same species, or even the same sub-genus, as Russell’s.

* Cuvier mentions two, Dr. Russell four.

† Cuvier says that the belly is sharp or carinated (*le ventre tranchant*); whereas Le Sueur, the original definer of the genus, and whom he quotes as his authority, expressly remarks that “they are easily distinguished from the *Clupeæ* by the absence of the carinated abdomen;” and again: “Body as in the genus *Clupea*, but without carinated abdomen.” See *Règ. Anim.* tom. ii. p. 326.; and *Am. Trans.* vol. i. 363—365.

4. SUBFAM. ESOCINÆ. *The Pikes.*

Dorsal fin single, close to the end of the tail ; mouth large ; teeth numerous, large, acute.*

5. SUBFAM. EXOCETINÆ. *Flying Fish.*

Teeth few, minute ; body herring-shaped, very broad on the back, but greatly compressed towards the belly ; mouth small, obliquely cleft ; teeth minute ; eyes large ; ventral fins lengthened.

EXOCETUS Linn. Pectoral fins excessively long, often reaching to the end of the tail ; ventral fins of variable length, but generally very long ; scales large, deciduous ; sides of the belly with a carinated line on each side ; caudal fin forked ; the upper lobe smaller than the under.

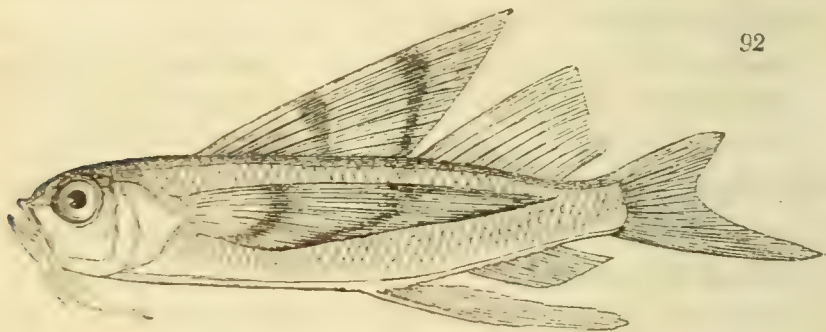
E. exiliens. Bl. 397.

fasciatus. Am. Tr. ii. pl. 4.

volitans. Bl. 398.

fig. 2.

Cypsilurus Sw. General structure of *Exocetus*, but the mouth is furnished with barbels or cirri, either simple or forked. (*fig. 92.*)



92

C. Nuttallii Le Sueur. Am. Tr. ii. pl. 4. fig. 1.

appendiculatus Wood. Ib. iv. p. 283.

RAMPHISTOMA Raf. Body linear, lengthened, subcylindrical ; jaws excessively long, generally pointed, and armed with acute teeth ; scales minute, sides of the belly carinated.

Ramphistoma Raf. Both jaws nearly equal, straight, narrow, and ending in points ; dorsal and anal fins

* Except in *Exocetus* and *Hemiramphus*.

equal, placed close to the caudal, which is forked ; ventral behind the middle.

vulgaris Sw. Yarr. i. 391.

Scombresox Lac. General structure of *Ramphistoma*, but the dorsal and anal fins are longer, and the hinder rays of both assume the character of detached finlets ; ventral fin nearly central.

saurus. Yarrell, i. 396.

equirostris. Am. Tr. i. 132.

hians. Raff. Car. 9. 1.

scutellatus. Ib. 132.

Hemiramphus Cuv. Upper jaw excessively short ; the under one very long, and flattened horizontally ; scales large.

longirostris. Russ. pl. 178.

Commersonii. Lac. v. pl. 7.

brevirostris. Ib. 177.

fig. 3.

marginatus. Lac. v. pl. 7. f. 2.

Braziliensis. Bl. 391.

Lepisosteus Lac. Head and body mailed with plates and scales of great thickness, which are also extended to the exterior rays of all the fins ; dorsal and anal fins small, ovate, and situated close to the caudal ; ventral fin placed half-way between the pectoral and anal ; upper jaw longer than the lower, broad, and armed with sharp unequal teeth.*

osseus. Bloch. pl. 390.

oxyurus. Raf. Ohio, p. 73.

platystomus. Raf. Ohio, p. 72.

longirostris. Ib. 74.

albus. Ib.

ferox. Ib. 75.

Litholepes Raf.† General characters of *Lepisosteus* ; body fusiform ; vent nearly central ; head lengthened into a long snout, beneath which is the mouth ; the jaws not lengthened ; teeth strong, unequal ; dorsal and anal fins equal and opposite ; caudal bilobed, not oblique ; ventral fin near the vent ; scales stony, impenetrable, diamond-shaped.

Lith. adamantinus. Raff. Fishes of Ohio, p. 76.

Esox Linn. Scales small, distinct ; muzzle oblong, obtuse, very broad, and considerably depressed ; mouth

* Divided by Rafinesque into two sub-genera ; his *Cylindrosteus* has the dorsal fin beginning behind the anal, while in *Lepisosteus* it is opposite : he has given descriptions of several species.

† Rafinesque says that for this remarkable fish he has principally "relied on a description and figure given by Mr. Audubon." It is the Diamond or Devil-fish, of the Americans.

very large, nearly every internal part covered with innumerable small teeth; with a series of others, long and pointed, on the sides of the lower jaw; scales small, distinct.

Esox lucius *Linn.* Bloch, pl. 32.

Galaxias Cuv. Scales obsolete; mouth small; tongue with strong hooked teeth; dorsal and anal fins opposite.

Esox truttacius *Cuv.*

Alepocephalus Risso.* Body with large scales, but none on the head; mouth small, with fine and crowded teeth; eyes very large; gills with eight rays.

A. rostratus *Risso.* Turin Trans. xxv. pl. 10. fig. 24.

LEPTODES *Sw.* Head large, obtuse, truncate; body linear, very slender.

Stomias Cuv. Body elongated, narrow, compressed, anguilliform; head large, round; mouth enormous, cleft almost to the gills, and armed with very long, remote, curved teeth; eyes exceedingly large; lower jaw longest; dorsal falcate; ventral fins very long and filiform; dorsal and anal placed close to the caudal which is rounded.*

Stomias *Rissoii.* Riss. Ichthy. pl. 10. fig. 34. p. 331.

Leptodes *Sw.* General structure of *Stomia*, but the teeth are more developed, and are so long that they project over the jaws when the mouth is closed; dorsal fin placed close to the head, and with the first ray prolonged into a filament†; caudal forked.

L. Sloanii. Sch. pl. 85. *L. Siculus.* *Sw.* App.

DIPLOPTERUS *Gray.*‡ Body herring-shaped; head rather lengthened; jaws considerably retractile;

* *Microstoma* Cuv., described by Risso with two dorsal fins, and placed by Cuvier just before *Stomias*, seems to me more like an *Atherina*: *Alepocephalus*, also, is so slightly defined that I almost hesitate to introduce it. §

† The genus *Salanx* Cuv. seems allied to *Leptodes*; but as only one species is known, not yet described, and nothing is said of its form, fins, &c., it is here omitted.

‡ The situation of this type is very uncertain; by its two anal fins it has an obvious relation to *Corica*.

teeth small or none (?); dorsal fin small, triangular, placed close to the caudal, and immediately above the second anal; pectoral and ventral fins small; ventral fins beneath the pectoral; the first ray continued into a long filament; anal fins two, the first small, and triangular; the second larger, and like the dorsal; caudal broad and rounded.

Dip. pulcher. Gray, Ind. Zool. (Vol. I. p. 308. f. 68.)

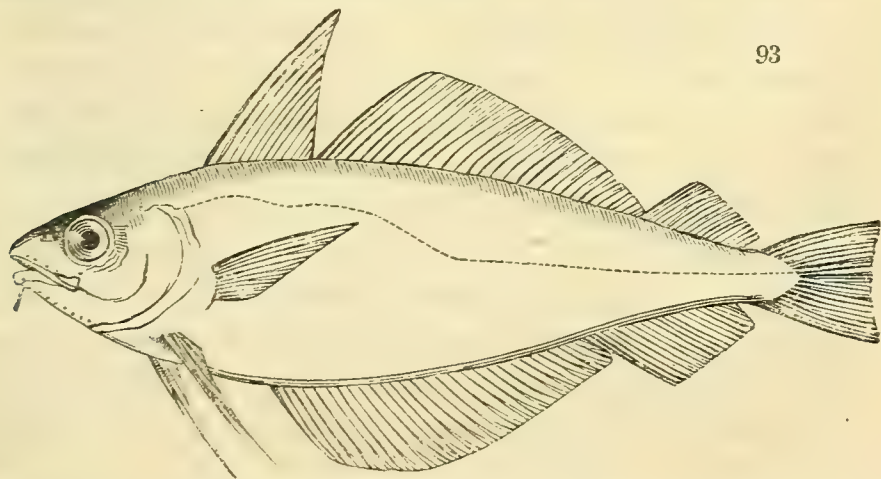
FAMILY 2. GADIDÆ. *Cod-fish.*

Body slimy; scales very small; fins fleshy; all the rays soft, and covered with the common skin; head large, depressed; body more or less lengthened, compressed; ventral fins very small; the first and second ray often lengthened into filaments; the others small, obsolete, or entirely wanting.

1. SUBFAM. GADINÆ.

Dorsal fins three; anal fins two.

GADUS *Linn.* Dorsal fins three, the first triangular; lower jaw with a barbel or cirrus; caudal fin either truncate or slightly lunate; ventral fins two, distinct, placed beneath the two hinder dorsals; ventral fins lanceolate; gills seven-rayed. (*fig. 93.*)



morrhua. Bl. pl. 64.

blennoides (*fig. 93.*) Sw. App.

MERLANGUS *Willughby*. Similar to the last, but without cirri.

vulgaris Will. Bl. 65.

TILESIA * *Sw*. Body slender, lengthened ; lower jaw cirrated ; dorsal fins three, equal ; caudal fin truncate ; lateral line curved in the middle.

T. gracilis. Til. Piscium. i. tab. 18.

LEPIDION *Sw*. Dorsal fins two, the first triangular, with the anterior ray prolonged into a filament ; anal fins united, the first triangular, the second long and broad ; ventral fins slender, with six rays, the first very long ; mouth large ; lower jaw longest.

L. rubescens. Risso, xi. fig. 40. p. 118.

CEPHUS *Sw*. General structure of *Gadus* ; but the head is excessively large, depressed, and broad ; first anal ray ending in a filament.

C. macrocephalus. Til. Pisc. i. tab. 19.

2. SUBFAM. MERLUCCINÆ.

Dorsal fins two, the first sometimes composed of fleshy filaments, and scarcely perceptible ; anal fin one ; ventral fins with five distinct rays.

MERLUCCIUS *Raf*. First dorsal fin triangular ; the second as long as the anal ; caudal fin lunate ; cirri none ; ventral fins ovate.

M. borealis. Bl. 164. *sinuatus*. *Sw*. App. (Vol. I. p. 319.)

LOTA *Cuv*. Body elongated, somewhat anguilliform ; first dorsal fin triangular ; ventral fins small, pointed ; hinder dorsal and anal as in the last ; lower jaw cirrated.

L. molva. Bl. 69.

Motella *Cuv*. Resembling *Lota* ; but the first dorsal fin is almost obsolete, being composed of slender connected fleshy filaments extending to the length

* I feel very doubtful if this is a true type of form. Does not the *Hexagrammos Stelleri* of Tilesius belong to this sub-family ?

of the pectorals, and placed in a depression ; upper jaw with two or four cirri ; lower with one.

M. tricirrata. Bl. 165.

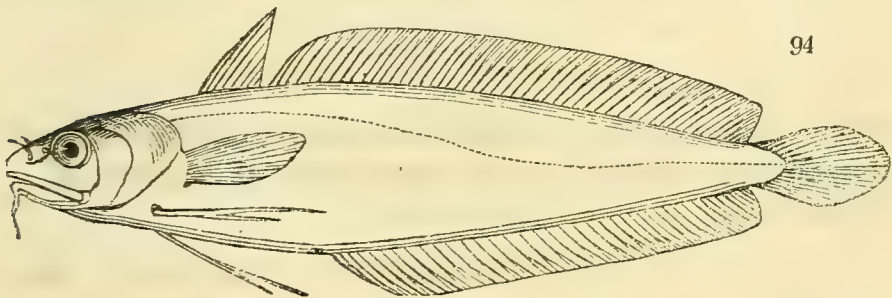
3. SUBFAM. PHYCINÆ.

Head broad, depressed ; ventral fins with the posterior rays obsolete, or altogether wanting ; dorsal fins two.

RANICEPS *Cuv.* Head greatly depressed and very large ; first dorsal fin minute, formed as in *Motella* ; the last ray lengthened ; ventral fins very small, of six rays ; the two first lengthened, and ending in short filaments ; the rest nearly obsolete ; caudal wedge-shaped.

R. trifurcatus *Cuv.* Yarrell, ii. p. 204.

PHYSIS *Arteni.* Dorsal fins two, the first triangular, and higher than the second ; head moderately large, depressed ; caudal rounded ; ventral fins each composed of a single cirriform ray unequally forked.



P. furcatus. Yarr. ii. 201.
longipennis. Sw. App.

Siculus. Sw. App. (*fig.* 94.)
(See Vol. I. p. 322.)

4. SUBFAM. BROSMINÆ.

Dorsal fin one, long.

BROSMIUS *Cuv.* General structure of *Lota*, but with one dorsal fin commencing above the pectoral, and near double the length of the anal ; caudal rounded ; ventral very small, thick, and fleshy.

B. Scotica. Penn. Brit. Zool. iii. pl. 37.

5. SUBFAM. BROTULINÆ.

Body anguilliform ; dorsal fin one, united to the caudal and the anal.

BROTULA Cuv. Tail terminating in a point; mouth with six cirri.

B. barbata Bl. Sch. pl. 31. fig. 2.

Pteridium Scopoli. Body anguilliform; dorsal, caudal, and anal fins united; ventral fin of a long, single, undivided ray; no cirri; tail pointed.

O. ater. Risso, Ichth. 142. pl. 11. fig. 41.

FAMILY 3. PLEURONECTIDÆ. *Flat Fish.*

Body very thin, oval; the dorsal and ventral fins extending nearly the whole length of the fish; the rays being simple, and nearly spinous, but hid in the flesh; both eyes placed on the same side of the head.

Pleuronectes Linn. Body rhomboidal; both eyes placed on the right side; the dorsal fin commences above the upper eye, and, as well as the anal, terminates before reaching the caudal; each jaw with a range of cutting teeth, and others tessellated.

P. platessa. Bloch, pl. 42.

Hippoglossus Cuv. Body more elongated and thicker than any of this family; eyes, fins, and teeth as in the last.

H. gigas. Bloch, pl. 47.

PSETTA Aristotle*, Cuv. Body rhomboidal; dorsal fin commencing at the edge of the upper jaw, and extending, as well as the anal, almost to the caudal; eyes approximating, with a short crest-like cirrus.

P. maximus. Bloch, pl. 49.

Platophrys Sw. General form of Psetta, but the eyes are very remote from each other, and the ventral fins are confounded with the anal.

P. ocellatus. Spix and Agassiz, pl. 46.

* I see no reason for substituting *Rhombus* Cuv. for the more ancient and classic name of *Psetta*, imposed by Aristotle upon this group; still less for transferring a nearly similar name, *Psettus*, to a group of Oriental fish which have no connection whatever with the *Psetta* of the ancients; and of which, in fact, they seem to have had no knowledge.

SOLEA Cuv. Body thicker and more lengthened ; mouth turned to the side opposite to the eyes, and having on that side only numerous slender teeth, but none on the other ; muzzle rounded, and projecting beyond the mouth ; the dorsal fin commences just at the tip, and, with the anal, almost joins the caudal ; two pectoral fins.

S. vulgaris C. Yarrell, ii. p. 256.

Brachirus Sw. General structure of *Solea*, but the caudal, dorsal, and anal fins are all united ; two pectoral fins.

plagiusa Linn.

Commersoni. Russ. No. 70.

orientalis. Sch. 157.

jerreus. Russ. No. 71.

zebra. Bloch, pl. 187.

Pan. Hamil. pl. 14. fig. 42.

Monochirus Cuv. The upper pectoral very small ; the under one obsolete.

M. linguatula. Rond. 324.

Achirus Lac. Both pectoral fins wanting ; the dorsal and ventral fins distinct.

A. barbatus. Geoff. Ann. Mus. i. pl. 11.

Plagusia Brown. Snout obtuse, and very much advanced before the mouth ; pectoral fins none ; dorsal, caudal, and ventral fins united.

P. bilineata. Bloch, 183.

FAMILY 4. SILURIDÆ. *Silures*, or *Cat-fish*.

Body mailed or naked ; no true scales.

1. SUBFAM. LORICARINÆ.

Head and body mailed, with large osseous plates ; head depressed ; eyes small ; mouth placed beneath.

LORICARIA Linn. Dorsal fin one.

Acanthicus Spix. Plates of the body armed with short spines ; caudal large, very lunate, the points lengthened.

A. hystrix. Spix and Agassiz, pl. 1.

Rhinelepes Spix. Plates smooth, but crenated at their edges ; caudal fin small, slightly lunate.

R. aspera. Spix and Agassiz, pl. 2.

Plecostomus Gron. Body lengthened ; head short ; cirri none ; tail very long ; caudal fin lunate, the upper point lengthened into a filament.

P. maculatus. Gronovius, pl. 2. Bloch, 375. fig. 2.

HYPOSTOMA Lac. General structure of *Loricaria*, but with a small adipose dorsal ; cirri short ; caudal fin large, lunulate.

H. flava. Bloch, pl. 374. *etentaculum*. Sp. and Ag. pl. 1.

HOPLISOMA Sw. Head and body compressed ; the sides of the latter mailed with two series of crenated plates ; dorsal fins two ; mouth terminal ; cirri moderate ; tail long ; vent beneath the dorsal fin.

H. punctata. Bloch, 377. fig. 2.

CATAPHRACTUS Gron. Head short, excessively broad and depressed ; body mailed as in *Hoplisoma* ; dorsal fins two ; mouth rather beneath.

C. depressus. Bloch, 377.

STURISOMA Sw. Body very long and slender, mailed, with two series of smooth plates ; muzzle produced depressed, narrowed ; mouth beneath ; vent nearly central ; dorsal fin single, placed over the ventral.

S. rostrata. Spix and Agassiz, pl. 3.

2. SUBFAM. PIMELODINÆ.

Body compressed, more or less naked ; dorsal fins two, the hinder adipose ; muzzle not produced ; anal fin short.

SYNODONTIS Cur. Body generally oval, compressed, the sides naked ; cirri of the lower jaw pectinated ; upper jaw longest ; lower teeth compressed, hooked, pedunculated and flexible at their base ; head and nape mailed.

ovata. Rüpp. Nil. Fish. pl. 3. 2. *serratis*. Ib. 2. f. 1.

MYSTUS *Artedi*. Body ovately oblong, the sides armed with a row of spinous plates ; head and nape mailed ; adipose fin long ; lower cirri sometimes pectinated, as in the last.

Gronovii. Gron. pl. 5. 1, 2. edentatus. Spix, pl. 5.
 carinatus. Lin. Sys. Nat. costatus. Bl. 376.
 504.

PIMELODUS *Lac*. Body oblong, the sides naked ; head and nape generally more or less mailed ; cirri long, simple ; mouth terminal ; anal fin short.

quadrimaculatus. Bl. 368. fig. 2.

Sisor *Hamilt*. Caudal fin small, slightly lunate ; the superior ray excessively prolonged ; second dorsal fin minute, nearly obsolete ; teeth none.

S. rabdophorus. Ham. p. 208. Gray, Ind. Zool. i. pl. 84. f. 1.

FELICHTHYS * *Sw*. Head short, very obtuse, depressed, anal fin lengthened ; vent central ; caudal forked.

F. filamentosus. Bl. pl. 365. *nodosus*. Bl. 368. fig. 1.

CYCLOPIUM *Sw*. Eyes very minute, vertical ; lower jaw longest ; anal fin short, placed below the second or adipose dorsal ; cirri two.

C. Humboldtii *Sw*. (*Pimelodus cyclopium* *Auct.*)

3. SUBFAM. SILURINÆ.

Anal fin and tail very long ; operculum moveable.

AGENIOSUS *Lac*. Dorsal fins two ; cirri small, or obsolete.

Ageniosus *Lac*. Head broad, considerably depressed, as in *Felichthys* ; the maxillary bones sometimes assuming the appearance of horns ; vent central ; anal fin moderately lengthened ; caudal forked.

A. militaris. Bl. 362. *inermis*. Bl. 363.

SILONIA *Sw*. Body of equal thickness with the head, which is not dilated ; eyes very large ; cirri two, very minute ; adipose dorsal very small, oval ; gill-mem-

* Substituted for *Breviceps*, a name already used in Erpetology.

brane ten-rayed ; ventral fin beneath the first dorsal ; caudal fin slightly lunate.

S. lurida. Ham. p. 160. 7. fig. 50. *diaphina*. Ib. p. 162.

PACHYPTERUS Sw. Dorsal fins two, the hinder one small and adipose ; ventral fin very long ; vent close to the head ; cirri much developed ; caudal forked.

Hypophthalmus Sp. and Agass. Body oval oblong ; muzzle very much depressed ; eyes very remote and lateral ; the first dorsal placed before the ventral fin.

H. nuchalis, Spix, pl. 37. *edentatus*. Ib. pl. 9.

Pachypterus Sw. Body oblong ; muzzle slightly depressed ; eyes not remote ; the first dorsal placed over the ventral ; eyes rather large.

P. Atherinoides. Bl. 371. f. 1. *punctatus*. Ham. p. 196. f. 64.
luridus. Ham. p. 163. f. 62. *melanurus*. Ib. (*murius* Ham.)
trifasciatus. Ib. p. 180. f. 59. p. 195.

SILURUS Linn. Dorsal fin single, very short ; cirri long ; caudal either forked or rounded.

Clupisoma Sw. Herring-shaped ; head and body compressed, of nearly equal breadth ; eyes very large ; teeth in both jaws and on the palate granulated and crowded ; caudal fin large, forked ; dorsal fin placed almost above the pectoral ; vent nearly central.

C. argentata. Ham. 156. pl. 21. fig. 50.

Callichrus Hamilton. Head large, depressed ; mouth large, not vertical ; dorsal fin close to the head ; anal fin excessively long ; vent close to the pectoral ; caudal fin forked.

C. macrostomus. Ham. 154. *vittatus*. Ham. pl. 25. fig. 47.
 pl. 29. fig. 49. *immaculatus*. Ib. 151. (*canio*).
bimaculatus. Bloch, 364. *affinis*. Ib. 152. (*duda*).
nebulosus. Ham. 152. *erythrogaster*. Ib. pl. 17. 48.
 (*Chechra*.)

Silurus Linn. Body ovate lanceolate ; head broad, much depressed ; dorsal and anal fins as in *Callichrus*, but the caudal fin is rounded.

S. glanis Linn., Bl. *biserratus*. Ham. pl. 37. f. 46.
fossilis. Bl. 370. fig. 2. *laticeps* Sw. Appendix.

Malapterurus Lac. Dorsal fin adipose, placed close to the caudal ; muzzle obtuse, turned upwards ; lower jaw shortest ; caudal fin forked ; anal fin very long.

M. electricus. Geoff. Egypt. Bengalensis. Ind. Z. pl. 85. 2. pl. 12. fig. 1. Cuvierii. Ib. pl. 85. fig. 1.

Pusichthys Sw. General shape and fins of *Callichrus* ; head broad and obtuse ; mouth small, turned upwards, the aperture vertical ; cirri very short ; tail forked.

P. uranoscopus. Rüpp. Egypt. pl. 1. fig. 1. *a. b.*

Plotosus Bl. Dorsal fin single or double, one of them very long, extending the whole length of the back ; caudal rounded ; cirri long.

Clarias Gronov. Dorsal fin single ; caudal fin rounded, distinct from the dorsal and anal ; vent almost central ; eyes small.

C. anguillaris Linn. Russ. *Hamiltonii* Sw. Ham. 146. pl. 168. pl. 26. fig. 45.

Plotosus Bl., Ham. Dorsal fins two ; caudal fin united with the second dorsal and anal ; tail very long, eel-shaped.

P. vittatus. Bl. 373. fig. 1. *caninus*. Ham. 142. pl. 44.

Platystacus Ham. (Bloch, *pars.*) Body short, depressed, thick, as long as the tail ; fins as in *Plotosus* ; the first dorsal with a serrated spine ; tail short ; head very broad, truncate ; mouth excessively large ; under jaw longest ; eyes minute, nearly vertical ; caudal fin extending beneath to the base of the anal ; jaws and palate with minute sharp crowded teeth.

P. chaca. Ham. 140. pl. 28. fig. 43.

Heterobranchus Geoff. Body anguilliform, resembling *Clarias* ; dorsal fins two, both long ; the hinder adipose ; branchia with ramified appendages.

H. bidorsalis. Geoff. Egypt. Poiss. pl. 16. fig. 2.

Cetopsis. Body oblong, round, thick ; tail short ; dorsal fin single, placed near the head, between the

pectoral and ventral ; anal fin rather lengthened ; vent nearest the caudal fin ; eyes vertical, very minute, placed close together on the crown ; cirri short.

C. cœcutiens, Agass. and Sp. Spixii. Ib. pl. 10. fig. 1.
pl. 10. fig. 2.

4. SUBFAM. ASPREDINÆ.

Eyes very small, vertical ; operculum immoveable, the aperture opening only by a narrow slit beneath the head ; under jaw transverse, and shorter than the upper ; first pectoral ray generally excessively developed ; dorsal fin single, placed close to the head.

COTYLEPHORUS Sw. Head and body very broad, flattened, and short ; tail long, slender, compressed ; anal fin greatly lengthened, but not united to the caudal, which is forked ; dorsal short, triangular ; belly with cup-shaped suckers.

C. Blochii Sw. (*Platys. cotylephorus*. Bl. 372.)

ASPREDO Artedi. Body and head broad and depressed ; tail moderate, slightly compressed, with soft tubercles or pores on the sides ; head and crown with bony plates ; eyes vertical, excessively minute ; pectoral spine very large ; anal fin short ; caudal rounded ; cirri moderate.

A. verrucosus. Bl. 373. f. 3. *Gronovii*. Zoop. pl. 5. fig. 3.

ASTROBLEPUS Humb. Body smooth ; head broad ; eyes vertical, very minute ; tail short, thick ; caudal fin truncate ; anal fin short, placed close to the caudal ; dorsal single, near the head ; the first or outer ray of all the fins soft, and slightly lengthened ; cirri two.

A. Grexalvii Humb. Zool. (Vol. I. p. 355.)

Eremophilus Humb. Body smooth, oblong ; eyes very small, lateral ; dorsal fin single, near the caudal, but before the anal, which is short ; caudal fin slightly rounded ; pectoral fin pedunculated, placed near the belly ; cirri six.

E. Mutisii. Humb. Zool. (Vol. I. p. 358.)

5. SUBFAM. SORUBINÆ.

Head large, much lengthened, depressed, bony ; muzzle broad and obtuse, projecting beyond the lower jaw ; cirri long ; dorsal fins two, the hinder generally adipose ; caudal lobed or forked, rarely lunate.

PHRACTOCEPHALUS *Agassiz*.^{*} Head and body thick, the former covered with granulated bony plates, which extend to the first dorsal ; second dorsal fin small, the base adipose, the upper portion with slender soft rays ; eyes very small, nearly vertical ; pectoral spine, as in *Aspredo*, greatly developed ; tail short ; the caudal slightly lunate.

P. bicolor. Spix and Agassiz, pl. 6.

PTERONOTUS *Sw*. Body and muzzle lengthened ; dorsal fins two, the second very long, low, and furnished with numerous soft and slender rays ; vent central ; anal fin short ; caudal forked ; the first dorsal ray slender, spinous, but not longer than the others.

P. 5-tentaculatus. Sp. and Ag. pl. 11.

SORUBIUM *Spix*. (*Platystoma* † *Agassiz*.) Body and head lengthened ; dorsal fins two, the second adipose and triangular ; vent nearest the caudal ; anal fin short ; caudal forked or lobed ; muzzle projecting beyond the lower jaw.

S. infra-ocularis. Sp. Ag. pl. 15. *maculatum*. Ib. pl. 13.

truncatum. Ib. pl. 13. *a.* *semipunctatum*. Ib. pl. 14.

FAMILY 4. COBITIDÆ.

Generation viviparous ; body lengthened, slimy, covered with minute scales ; mouth very small, placed beneath the snout, with thickened lips ; teeth often wanting ; the

* This type, by its eyes and pectoral spines, appears to form a passage from the last to the present subfamily ; while *Pteronotus* seems intermediate between *Phractocephalus* and *Sorubium*.

† *Platystoma* having been used in ornithology, I retain the original name (although objectionable) of Spix ; but I perfectly agree with Agassiz in his opinion on the impropriety of barbaric names, whether generic or specific.

sides furnished with cirri ; ventral fins nearly medial ; tail very broad and thick ; gill-opening small ; the branchia frequently of only three rays.

ANABLEPS * *Artedi*. Eyes very prominent, apparently double ; body cylindric, oblong, the scales strong and compact ; head small, short, much depressed, but not widened ; the mouth transverse ; teeth, in both jaws, small and crowded ; pectoral fins large, broad and scaly at their base ; ventrals very small, placed close to the anus ; tail nearly as long as the body, with a small dorsal fin in the middle, and behind the anal.

A. tetrophthalmus. Gronov. Mus. pl. 1. f. 1, 2, 3. Bl. pl. 361.

1. SUBFAM. COBITINÆ.

Body lengthened ; head with cirri ; mouth inferior ; teeth none ; dorsal fin central, above the ventral.

COBITES. Body lengthened, slender, slimy, cylindrical before the dorsal fin, and compressed on the tail ; caudal fin truncate, or rounded. Europe only ?

C. barbatula Linn. Bl. 31. fig. 3. Yarr. i. 376.

Acoura Sw. General structure of the last, but the body destitute of scales, and the caudal fin generally lobed. India.

C. obscura. Hamilt. p. 357. argentata. Ib. 358. No. 10.
No. 9. (aberrant.) cinerea. Ib. 359. No. 12.

CANTHOPHRYS Sw.† Beneath the eye a moveable prickle reposing in a groove ; mouth with cirri.

Canthophrys proper. Body destitute of scales ; caudal fin rounded.

C. albescens. Ham. Cob. No. 3. olivaceus. Ib. No. 8.
rubicinosus. Ib. No. 6. vittatus. Ib. No. 4. (aberr.)

Diacantha Sw. Body oval, destitute of scales ; caudal fin forked.

C. zebra. Hamilt. pl. 11. f. 96. flavicauda. pl. 29. f. 95.

* It was Gronovius, and not Bloch, as Cuvier supposes, who first designated this as a genus.

† Mr. J. E. Gray observes that his genus *Botia* " includes all Hamilton's *Cobites* belonging to this genus." These I have here characterised as four subgenera.

Somileptes Sw. Body lanceolate, much compressed, covered with small but conspicuous scales; eyes very large, placed near the muzzle; caudal fin rounded.

S. bispinosa. Hamilt. p. 351. *unispina*. Ib. No. 1. p. 350.

2. SUBFAM. PÆCILINÆ.

Body thick, oval, compressed; scales large; head small, flattened above; snout sharp; mouth small, transverse; jaws protractile.

PÆCILIA *Sch.* Body ovate; jaws flattened horizontally, the lower jaw longest; mouth small, furnished with a row of small and very slender teeth; dorsal fin one, central, and opposite to the anal; ventral half-way between the anal and pectoral fins; caudal fin obtuse, sub-truncate; the branchia three-rayed.

P. multilineata. *Le Sueur*. Am. Tr. ii. pl. 1.

Fundulus Lac. Related to *Pæcilia*; teeth as in the last, but there are others rather stronger and conic on the pharynx; branchial rays four.

F. heteroclita *Val.*

LEBIA *Cuv.* Body oval; head small; eyes large, placed towards the summit, and near the snout; mouth small, with compressed and incurved teeth denticulated into three to four points; ventral fin very small, central, placed beneath the dorsal, and half-way between the pectoral and anal; caudal truncate.

L. elipsoides *Le S.* Am. Tr. ii. pl. 2.

MOLINESIA *Le Sueur.* Dorsal fin very high, and nearly occupying the whole extent of the back; the anal fins placed between the ventrals; pectoral and caudal fins large, rounded; head flattened above; mouth remarkably small; teeth small and crowded, those in front hooked, the hinder ones velvety; branchial rays four or five.

M. latipinna *Le Sueur.* Am. Tr. ii. pl. 3.

ORDER III. CARTILAGINES. *Cartilaginous Fishes.*

Bones cartilaginous ; branchia or gills concealed beneath the skin, upon which, however, there are as many small apertures as there are internal rays ; fins in general perfect ; body either pisciform*, or suborbicular and greatly compressed.

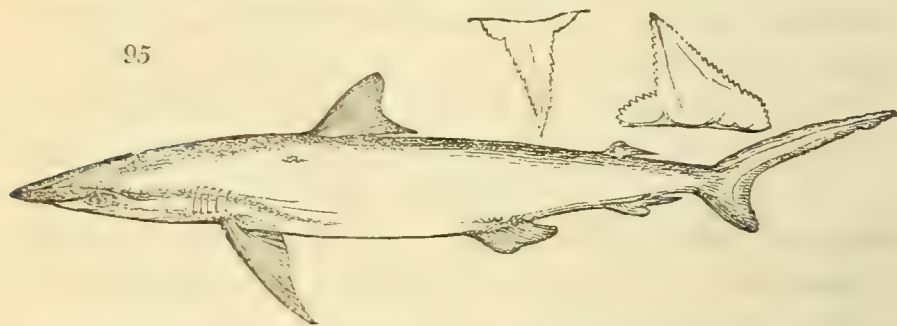
FAMILY. 1. SQUALIDÆ. *Sharks.*

Body pisciform ; all the fins free and distinct ; snout or fore part of the head more or less broad and protruded beyond the mouth, which is placed beneath ; teeth acute.†

1. SUBFAM. SQUALINÆ. *Typical Sharks.*

Spiracles or air-holes behind the eyes either entirely wanting, or exceedingly minute, so as to become obsolete ; dorsal fins two, without spines.

SQUALUS Linn. Spiracles entirely wanting ; snout broad, depressed ; teeth compressed, cutting, and pointed, generally toothed or serrated on their sides ; first dorsal fin before the pectoral, the second nearly opposite to the anal ; nostrils placed under the middle of the snout ; the posterior branchial apertures extending above the pectoral fins.



S. Carcharias. Linn. Belon.
pl. 60.

glaucus. Bloch, pl. 86. Yarr.
ii. 381.

* By this term is meant that form seen in the generality of fishes.

† Except in such types as form the passage to the rays, as *Pristis* and *Mustelus*.

Alopias Raf. Spiracles none ; dorsal fins two, the posterior adipose ; tail and caudal fin very long, unequally and obliquely divided ; the former as long as the body ; muzzle rounded ; teeth flat, minute, and acute.

A. macrourus. Raf. Carat. vulpis Sw. Yarr. ii. 379.

Cerictius Raf. “Spiracles wanting ; dorsal fins two, the posterior much the largest, and bilobed ; branchial apertures five on each side ; head with two bony appendages in the form of horns.”

C. macrourus. Raf. Carat.

DALATIAS Raf. “Spiracles none ; dorsal fins two, furnished with anterior spines ; anal fin wanting ; tail unequally and obliquely lobed ; teeth unequal, acute, disposed in different directions ; mouth small ; eyes round ; branchial apertures five, narrow ;” head with numerous minute pores* scattered on both sides ; skin finely tuberculated.

D. nocturnus. Raf. Carat.* pl. 11.

SELACHUS. Caudal fin large, lunated, the lobes nearly or quite equal ; teeth conic, acute, entire.

Isurus Raf. No spiracles ; dorsal fins two, the posterior adipose ; anal fin one, adipose ; tail large, vertical, equally divided, and lunate ; snout very acute ; base, or end, of the tail angulated, and nearly winged on each side ; branchial apertures very long and narrow ; each jaw has three rows of teeth near the palate ; eyes small and round ; hinder dorsal opposite the anal fin.

I. oxyrinchus Raf.

Selachus Cuv. Teeth small ; snout short, obtuse ; branchial apertures remarkably large ; extending

* See also Vol. I. p. 129. The other species of *Dalatias*, described by Rafinesque, is his *D. sparaphagus*, differing in having no spines to the dorsals ; its teeth are flat, long, acute, the lower in one row, and the upper in two, these latter being the smallest.

nearly half-way round the neck ; spiracles either obsolete or very small.

S. maximus. Auct. Pennant, iii. pl. 16. Yarr. ii. 396.

Lamna Cuv. Spiracles either wanting or very minute ; snout pyramidical ; branchial apertures placed before the pectoral fins ; sides of the tail with a projecting carinated ridge ; teeth as in *Squalus*.

L. cornubicus. Bloch, pl. 86. *monensis* Cuv. Yarr. ii. 387.

RHINEODON Smith. "General characters of *Selachus*, but with the mouth placed at the tip of the snout ;" spiracles wanting ; no type mentioned ; rank and affinities uncertain.

Tetroras Raf. "No spiracles ; dorsal fins two ; anal one ; branchial apertures rather large, four on each side ;" muzzle obtuse ; teeth in the form of a rasp, without lateral lines ; a carinated appendage on each side the tail.

T. Angiova. Raf. Carat. p. 11.

Heptranchias Raf. "Dorsal fin one ; anal one ; branchial apertures seven on each side ; tail unequal, oblique." Taken from Lacepede.

H. cinereus (*Squalus cinereus* Lac.)

Scoliodon Mull., Hen. "Differs from *Squalus* only by the teeth being of the same shape in the upper and lower jaw ; viz. the points directed towards the corner of the mouth, with a smooth edge and a truncated protuberance, either smooth and indented, on the exterior side of the base. (5 species.)"

Leptocharias Smith. "Nasal valve elongated into a cirrus ; caudal dimple wanting ; lower lobe of the caudal fin obsolete ; teeth numerous, with one or two lateral denticles on each side, as in *Scyllium*. (1 sp.)"

2. SUBFAM. CENTRININÆ.

Head furnished with spiracles behind the eyes ; dorsal fins in the typical genera generally armed with spines.

CENTRINA. Anal fin wanting ; dorsal fins two, each being generally armed with a strong spine.

Centrina Cuv. Form thick and heavy ; dorsal spines strong, and placed in the fleshy part of the fins ; the hinder dorsal opposite to the ventral fin ; cutting teeth in the lower jaw placed in two rows ; those on the upper narrow, pointed, and in several rows.

C. oxynotus Sw. Bloch, pl. 115.

Spinax Cuv. General aspect of *Mustelus* ; spines placed in front of the dorsal fins, which are two ; jaws with several rows of small cutting teeth, either the same in both jaws, or those of the upper tricuspidate.

S. acanthias. Bloch, pl. 85. Yarr. ii. p. 400.

Etmopterus Raf. Spiracles two, round ; muzzle produced ; dorsal fins two, laciniated, and both armed with a spine in front, the second nearly opposite to the anal ; anal fin none ; tail unequal, oblique ; only three branchial apertures ; teeth small, acute.*

E. aculeatus. Raf. Carat. p. 14.

Scymnus Cuv. General structure of *Centrina*, but the dorsal fins are without spines (thus representing *Scyllium*) ; body smooth ; upper teeth straight and narrow.

S. borealis Scoresby. Yarrell, ii. 403.

Centrophorus Muller and Henle. Resembling *Spinax*, but the body covered with hard carinated scales or prickles ; lower teeth indistinctly serrated ; upper teeth equilateral, and not serrated.

Sq. squamosus Lac.

spinosus Lac.

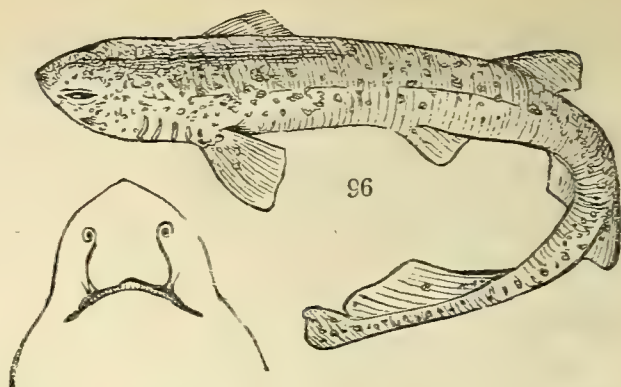
GALEUS Antiq. Raf. Dorsal fins two, destitute of spines ; anal fin present ; general form of *Scymnus* ; branchial apertures five ; tail and caudal fin oblique ; divisions unequal ; teeth serrated only on one side.

G. vulgaris. Bloch. pl. 118. Yarrell, ii. 390.

SCYLLIUM Cuv. (fig. 96.) General characters of *Selachus*, with which it agrees, also, in the presence of very small spiracles ; but the caudal fin is elongated, oblique,

* See Vol. I. p. 131.

irregularly lobed, and truncate at the tip; the teeth are tricuspidate, having three points; dorsal fins



placed very near the caudal, the first being generally behind the ventrals; head much depressed and rather broad.

S. canicula. Bloch, pl. 114. (fig. 96.)

CESTRACION *Cuv.* Head not depressed, irregularly cylindrical; eyes almost vertical, placed very near the crown, which is marked by two ridges; dorsal fins two, each furnished with a spine placed in front; ventral fin placed between the two dorsals; caudal moderate, unequally forked; mouth terminal; anterior teeth small, pointed, and crowded; posterior teeth obtuse, tessellated.

C. Phillipii. (Vol. I. p. 147. fig. 17.)

MUSTELUS *Raf.* General form of *Galeus*, but with all the teeth flat and tessellated, as in the Rays; spiracles very large; under lobe of the caudal very short.

M. lævis *Cuv.* Yarrell, ii. p. 393.

Spiraculated sharks, whose natural affinities are uncertain, and whose rank as sub-genera or aberrant species has not been ascertained.

Hexanchus *Raf.* "Spiracles two; branchial apertures six on each side; dorsal and anal fin single; tail unequal, oblique."

S. griseus *Lac.*

Galeocerdo *M. and H.* "Teeth strongly serrated on the exterior edge, finely on the interior; spiracles small;

a dimple at the root of the tail ; the upper lobe of the caudal elongated, with two incisions.”*

Oxyrhina Agass. “Teeth long and thick, like nails, without lateral denticles, the anterior ones introverted ; third tooth in the upper jaw small and short ; spiracles small.”

Rhiniodon Smith. “Spiracles small ; mouth on the top of the snout.”—N. B. This, which is evidently a chironectiform type, is placed by MM. Müller and Henle in their family Lamnoidea, which is stated to have the caudal fin in the form of a crescent, with a lateral keel and a distinct dimple ; the second dorsal and anal fins opposite.

Pristiurus Bon. “Differs from *Scyllium* only by its long snout, and by a series of larger scales, arranged like a saw, on the upper edge of the tail.”

Chiloscyllium M. and H.* “Anal fin placed further back than the second dorsal, and the last branchial opening approximating to the fourth. The characteristic mark of this genus is the broad membranaceous under lip, separated from the skin of the throat by a kind of furrow ; the upper nasal valve bears a cirrus. (4 Sp.)”

Loxodon M. and H. “Spiracles very small ; teeth flat, sharp, without serratures, as in *Scoliodon* ; a dimple at the root of the tail ; caudal fin as in *Galeocerdo*, but the lower lobe has only one incision. (1 Sp.)”

Triglochis M. and H. “Spiracles small ; branchial openings large, as in *Lamna* ; tail as in *Carcharias*, but without the dimple ; the first dorsal placed before the ventral, and the second between the ventral and the

* No examples of MM. Müller and Henle's genera have been given, which still further increases the difficulty of understanding them.

† We have before expressed our opinion on the very artificial nature of the arrangement of the cartilaginous fishes by Müller and Henle, as exhibited in their paper already quoted ; nevertheless, we deem it advisable to insert most of their subdivisions, that they may be hereafter compared with those of Rafinesque, and the priority of nomenclature to such as are detained be equitably adjusted.

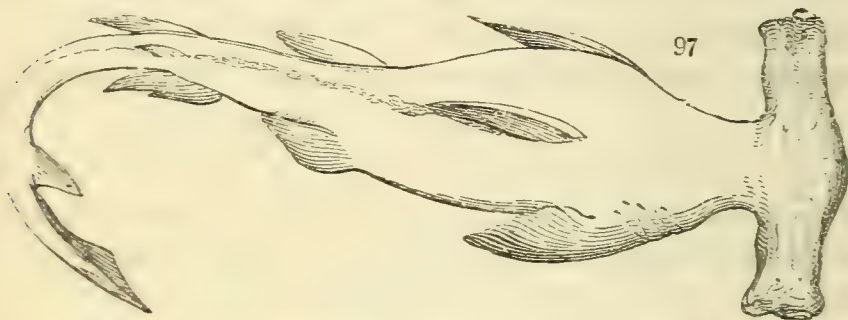
anal ; teeth long, pointed, with one lateral denticle or two on each side."

Alopecias M. and H. " Head, dorsal, and anal fins, and spiracles as in *Lamna*, but the branchial openings are small ; upper lobe of the caudal extremely elongated ; a dimple on the tail, but no lateral keel ; teeth sharp, triangular, without serrature or protuberance. (1 Sp.)"

3. SUBFAM. ZYGANINÆ.

Spiracles wanting ; head excessively dilated on each side ; eyes very remote.

ZYGANA *Antiq.* (fig. 97.) Head hammer-shaped ; the eyes placed at the two extremities.



Z. laticeps Cantor.* (Vol. I. p. 134. fig. 11.)

Platysqualus Sw. Head more or less heart-shaped ; anal fin placed opposite to the second dorsal.

S. tiburo Linn. Russ. pl. 12. fig. 2.

4. SUBFAM. CROSSORHINÆ.

Mouth terminal and almost vertical, surrounded with strap-like cirri or lobes ; eyes placed close to the crown ; spiracles large.

CROSSORHINUS M. and H. Dorsal fins two, placed close to the caudal fin ; teeth acute.

C. lobatus. (Vol. I. p. 143. fig. 15.)

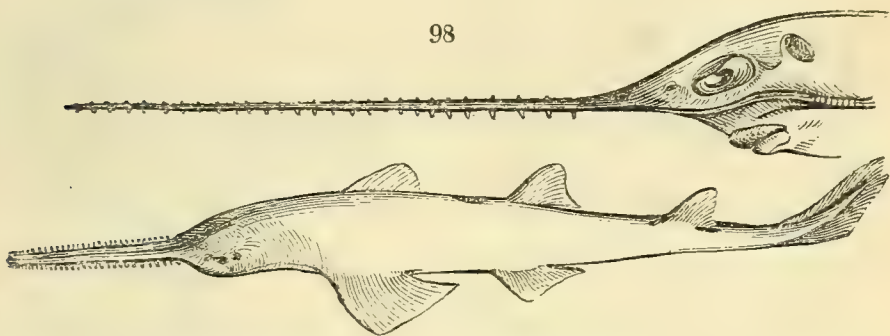
5. SUBFAM. PRISTINÆ.

Snout produced into an osseous, flat, sword-shaped plate, armed with spines on the sides ; mouth beneath.

* Quarterly Medical Journal of Calcutta, No. 3., July, 1837.

PRISTIS Latham. (fig. 98.) Teeth small, rounded, and extending over the tip.

98



P. antiquorum Lath.

semi-sagittatus. Russ. pl. 13.

FAMILY 2. RAIDÆ. Rays, Skates, Thornbacks.

Head generally surrounded by the pectoral fins, the margins of which form a continuous line with the snout.

1. SUBFAM. TRYGONINÆ. Sting Rays.

Head surrounded by the pectorals; tail armed with spines or prickles; eyes far removed from the circumference.

TRYGON Antiq. Body smooth; tail attenuated, the tip acute, with narrow fins above or below, the base armed with a prolonged spine, serrated or smooth.

T. Forskalii. Rüpp. pl. 13. fig. 2.

lymnæ. Ib. fig. 1.

PASTINACA Antiq. Resembling Trygon, but the tail is naked, having one or two spines, but without any perceptible fin either above or below.

P. olivacea Sw. Yarrell, ii. 442. Bloch, pl. 82.

brevicauda Sw. Russ. i. pl. 5. *dorsalis* Sw. Russ. 1. pl. 4.

PTEROPLATEA M. and H. Breadth of the body and pectorals greater than the length; tail very short, with or without spines, but always without fins.

P. annulata Sw. Russ. i. pl. 6.

RAIA Linn. (fig. 99.) Body in general beset with

sharp prickles or spinous tubercles ; tail destitute of a serrated spine, but bearing two small dorsal fins close to the caudal fin, which is nearly obsolete.

R. clavata. Yar. ii. 436.
rubra? (fig. 99.)

ANACANTHUS *Ehrenb.* General structure of *Pastinaca*, but there is neither spine nor fin upon the tail.

A. orbicularis (?) Bl.
Sch. 360.



2. SUBFAM. PTEROCEPHALINÆ. *Eagle Rays.*

Pectoral fins distinct from the head and snout, which they do not surround as in the last subfamily ; breadth of the body greater than its length ; caudal spine small or wanting ; a small dorsal at the base of the tail, which is long and always naked.

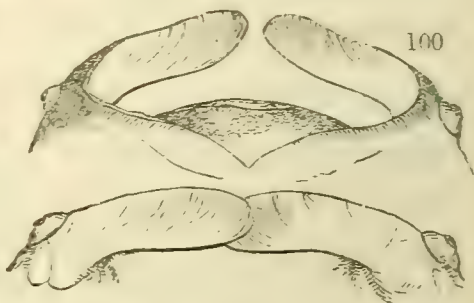
MYLIOBATES *Cuv.* Head prominent, protruding beyond the pectorals ; tail excessively long.

M. aquila. Duhamel, ii. pl. 10.

RHINOPTERA *Kuhl.* Muzzle deeply emarginate, or divided into two short lobes, beneath which are sometimes two others ; mouth placed beneath ; teeth small, tuberculated and pointed ; tail short ; basal spine.

R. quadrilobata *Le Sueur*. Am. Tr. i. p. 44. pl. 30.

CERATOPTERA *M.* and *H.* (fig. 100.) Resembling the last, but the two lobes assume the appearance and office of fins ; head truncate ; mouth terminal ; teeth resembling scales or leaves.



C. Lesueurii *Nob.* Les. Am. Tr. i. p. 115. f. 6.

ÆTOBATIS *Muller* and *Henle*. General structure of *Myliobates*, but the lower jaw projects considerably beyond the upper.

A. Indica. *Russell*, i. pl. 8.

PTEROCEPHALA *Sw.** Resembling *Ceratoptera* and *Rhinoptera*, but the mouth is placed on the under side, and the teeth are small, pointed, and tuberculated; the lobes of the head are porrect, and do not appear to perform the office of fins.

P. Giorna. *Lac*. v. pl. 20. 3.

3. SUBFAM. TORPEDINÆ. *Torpedo Rays*.

Head excessively large, surrounded by the pectoral fins, so as to form a circular disk; tail fleshy, not longer than the body, and bearing the ordinary fins; mouth beneath.

TORPEDO *Linn*. With two dorsal fins.

Torpedo electrica *Auct*.

TEMERA *Gray*. General form of *Torpedo*, but destitute of dorsal fins.

T. Hardwickii. *Gray*, *Ind. Zool*.

4. SUBFAM. SQUATINÆ.

Head moderate, obtuse; the mouth placed at the extremity of the snout; pectoral fins large, cut out in front, so as to allow the free motion of the head.

SQUATINÆ *Dum*. Form somewhat shark-like; mouth furnished with short cirri; margin of the pectorals, and sometimes the body, armed with small spines.

S. Europæa. *Bl*. 116. *Dumerilii* *Le Sueur*. Vol. I. fig. 23.

5. SUBFAM. RHINOBATINÆ.

Muzzle generally lengthened and pointed; but not so long as the body.

RHINOBATES *Lac*. Head and pectorals united, and as-

* *Cephaloptera* *Dum*. See Vol. I. p. 174.

suming a lengthened, heart-shaped form ; the snout much prolonged ; tail thick, as in ordinary sharks ; teeth tessellated ; body smooth ; mouth beneath.

R. lævis. Russell. pl. 10.

Rhina Schn. General structure of *Rhinobates*, but with a short, broad, and rounded muzzle ; connected either to the *Torpedinæ* or to the *Trigoninæ* ?

R. cyclostomus. Bl. Sch. 72.

FAMILY 3. PRIONIDÆ. *Spoon Fish.*

Muzzle excessively prolonged into a flat, lanceolate plate ; operculum very large, with the branchial opening very wide, and formed as in ordinary fishes.

Polyodon Lac. Teeth very small, sharp, curved, and serrated ; mouth beneath ; dorsal fin single ; caudal regular, lunate.

P. reticulatus Sw. vol. I. p. 122. fig. 7. Lac. i. pl. 12. f. 3.

FAMILY 4. STURIONIDÆ. *Sturgeons.*

Body covered with large osseous plates or tubercles, which form carinated and spinous lateral lines * on the sides of the body, as well as on the back and belly ; mouth placed beneath ; the bony jaws performing the office of teeth.

Acipenser Linn. Muzzle prolonged and obtuse ; mouth furnished with cirri ; caudal fin lunate ; the upper lobe longest.

A. Sturio Linn. (Vol. I. p. 123. fig. 8.)

FAMILY 5. CHIMARIDÆ.

Snout abruptly obtuse ; tail long, attenuated, and pointed.

Chimæra Lin. Profile vertical ; muzzle conical, behind

* Hence we find that numerous genera, intended to represent this type, have the lateral line elevated or armed with spines : the *Loricarinæ*, the *Balistidæ*, the *Triglidæ*, all the horse mackerel, and others which will occur to the ichthyologist, are striking examples of this representation.

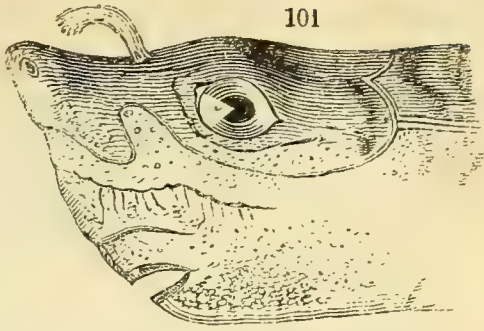
which is a crest-like prickly lobe; tail ending in a long filament.

C. monstrosa. Bloch, pl. 124. (*fig.* 101.)

Callorhynchus Gronov.

Snout terminating in a fleshy lobe, which curves over in front of the mouth; caudal fin surrounding the sides of the pointed tail.

C. antarctica. Gronov. pl. 4. f. 1, 2. (Vol. I. p. 125. *fig.* 9. *a.*)



ORDER IV. PLECTOGNATHES. *Cheloniform Fishes.*

Skeleton sub-cartilaginous; ribs obsolete; branchial spiracle single; scales none; eyes small, almost vertical.

FAMILY 1. BALISTIDÆ.

Body oval, either mailed with plates or covered by a hard coriaceous skin; mouth very small; jaws immoveable.

1. SUBFAM. OSTRACINÆ.

Body smooth, quadrangular in the typical, and triangular in the aberrant groups, covered by angulated bony plates, soldered at their sutures; dorsal fin one; no ventral fin; caudal rounded.

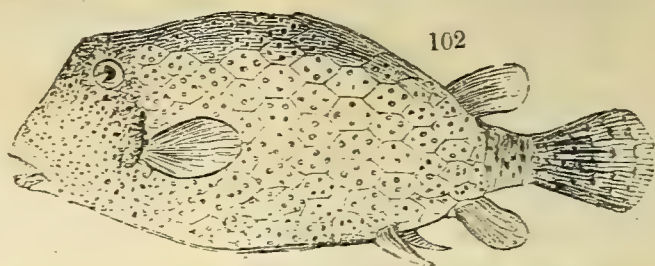
OSTRACION Linn. Body quadrangular; destitute of spinal processes.

O. cubicus. Bloch, pl. 137. *nasus.* Ib. pl. 138.

TETROSOMUS Sw. Body quadrangular; armed with spines on the back and belly.

T. turritus. Bl. pl. 136.

Lactophrys Sw. (fig. 102.) Body triangular, armed with strong spines; curved backwards just before the anal fin, and generally with two others, resembling horns.



L. trigonus. Bl. pl. 35. *cornutus.* Bl. 133.
bicaudalis. Ib. 132. *quadricornis.* Ib. 134.

Rhinesomus Sw. Body triangular, entirely destitute of spines, and often scored or reticulated as in the *Balistes*.

R. triqueter Bloch, pl. 130. *concatinatus.* Ib. pl. 131.

*Platycephalus** Sw. Compressed, subtriangular, with broad obtuse plates or spines scattered over the body and eyes.

P. auratus. Shaw, Nat. Miss. pl. 338.

2. SUBFAM. BALISTINÆ.

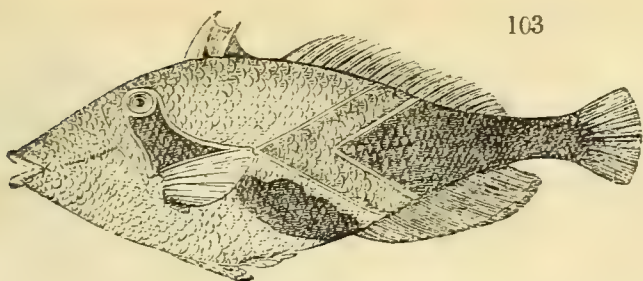
Body compressed, oval-fusiform, covered with a granulated coriaceous skin, which is (typically) reticulated; muzzle conic, much prolonged, ending in a very small mouth, furnished with a few sharp teeth in each jaw; pelvis sometimes forming a single ventral fin; dorsal fins two, armed in front with spines.

BALISTES Linn. Body scored, or divided into diamond-shaped granulated divisions; the interstices smooth; dorsal fins two, the first spinous; tail armed on each side by two or more series of acute prickles.

Balistes Linn. Spines in the first dorsal fin smooth, acute, with three membranaceous rays; caudal fin generally rounded.

Medinella. Freys. Atl. pl. 46. 2. (fig. 103.) *Lamarouxii.* Ib. fig. 1.
aculeatus. Bloch, pl. 149.

* *Acarana* Gray.



Rhinecanthus Sw. First dorsal spine thick, obtuse, serrated or tuberculated; caudal fin rounded; pelvis with spines but no rays.

ornatissimus. Lesson. Atl. 10. 1. *conspicillum*. Ib. pl. 9. 1.
lineatus. Benn. Cey. pl. 10. *amboynensis*. In. Z. 8. 3.

Melichthys Sw. Caudal fin doubly lunate; tail with six or seven rows of spines; pelvis hardly protruding, and without rays.

ringens. Bl. pl. 152. 2. *marginatus*. Ib. 2. pl. 15. 1.
albicaudatus. Rüpp. 2. 16 1. *Praslinensis*. Frey. Atl. 46. 1.

Canthidermis Sw. Body entirely covered with minute spines or prickles, exclusive of those larger ones on the tail; pelvis forming a simple spine without rays; caudal rounded; first dorsal spine obtuse, serrated.

angulosus. Frey. Zool. p. 210. *Gaimardii* Sw. Frey. Zool.
oculatus. Ind. Zool. 90. fig. 1. p. 209. *

CAPRISCUS. Body shaped and reticulated as in *Balistes*; but the tail destitute of prickles.

Zenodon Rüppell. The two lateral front teeth in the upper jaw lengthened and pointed; dorsal and anal of nearly equal breadth throughout; caudal large, simply lunate; pelvis small, without rays.

Z. niger. Rüpp. Atlas, ii. pl. 14. fig. 3.

Chalisoma Sw. Caudal fin large, doubly lunate; pelvis forming a ventral fin provided with rays; second dorsal and anal fins falcated; dorsal spine obtuse and rough; teeth — ?

C. pulcherrima. Lesson. Atl. pl. 9. fig. 2. *velata*. Bl. 150.

* *Balistes Jacksonianus*, Frey Zool.

Capriscus Antiq.,

Will. Caudal

fin truncate or

rounded ; pel-

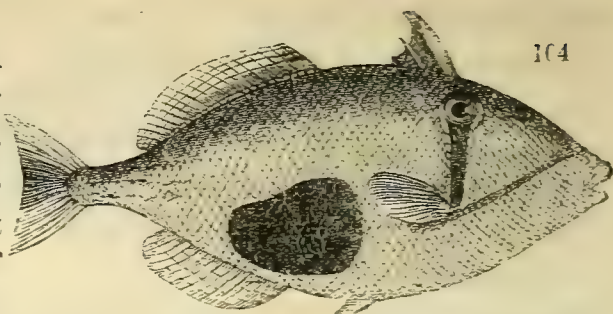
vis slightly pro-

jecting, but

destitute of

rays ; dorsal

spine obtuse and tuberculated ; teeth entire.

erythropterus. Less. Atl.10. fig. 3. (*fig.* 104.)*Rondelettii*. Yarrell, ii. 357.*rivulatus*. Rüpp. Atl. ii. 16. 2.*castaneus*. Ind. Z. i. pl. 90. 2.*niger* Sw. Appendix.

Leiurus Sw. Pelvis forming a large ventral fin provided with distinct rays ; dorsal spines acute and smooth ; caudal small, doubly lunate ; teeth longest in front, and sometimes notched in the middle.

L. macrophthalmus. Russ. pl. 22. *radiatus*. Bowdich, Mad.

Russellii. Ib. pl. 23.

pl. 17. fig. 45.

*Pachynathus** Sw. Body short, broad, compressed ; the head very large, and nearly as long as the body ; eyes very remote from the mouth, placed high upon the crown, and immediately above the pectoral fins ; front teeth remarkably long ; first dorsal spine obtuse and rough ; pelvis with minute rays ; caudal doubly lunate.

P. triangularis. Russell, pl. 20.

TRIACANTHUS Cuv. Ventrals represented by two large spinous rays attached to the pelvis, which does not project beyond the skin ; dorsal fins two, the first with spined rays ; body with minute prickles, shaped as in *Balistes*, but the tail much lengthened ; the caudal forked.

T. biaculeatus. Bloch, pl. 148. fig. 2.

* I have had much hesitation in characterising this as a subgeneric type ; but it differs so remarkably in its long, yet conic muzzle, that I am tempted to think it may be the chironectiform type of this genus, corresponding to *Psilocephalus* : the eye is so remote from the tip of the snout as to be nearly half way between that and the base of the caudal fin.

PSILOCEPHALUS Sw. Body linear, narrow, very long ; head and jaws excessively lengthened ; terminated by a small vertical mouth ; the chin prominent and bearded ; pelvis prominent and forming a dew-lap ; dorsal and anal single, of soft rays ; caudal fin very long and oval ; analogous to *Syngnathus*, *Mormyrus*, &c.

P. barbatus. Gray, Ind. Zool.

MONOCANTHUS. Body short, broad, furnished with prickles ; the first dorsal fin represented by a single dentated spine ; pelvis either prominent and spined, but destitute of rays, or altogether concealed ; belly and throat capable of distention.

Monocanthus Cuv. Body covered with a granulated, coriaceous skin ; the sides of the tail armed with recurved spines ; pelvis protruding beyond the skin, and generally armed with prickles.

hippocrepis. Frey. Z. p. 212. *Freycinettii*. Ib. 213.

geographicus. Règ. An. 12. 2. *Chinensis*. Ib. 152. fig. 2.

tomentosus. Bloch, 148. 1. *filamentosus*. Vol. I. 195. 29.

Cantherines Sw. Body smooth or granulated ; pelvis prominent ; no spines on the sides of the tail.

C. nasutus. * Frey. Zool. p. 214.

Chætodermis Sw. Body entirely covered with sharp prickles, intermixed with soft ciliæ or lobed appendages ; pelvis prominent, but no spines on the sides of the tail.

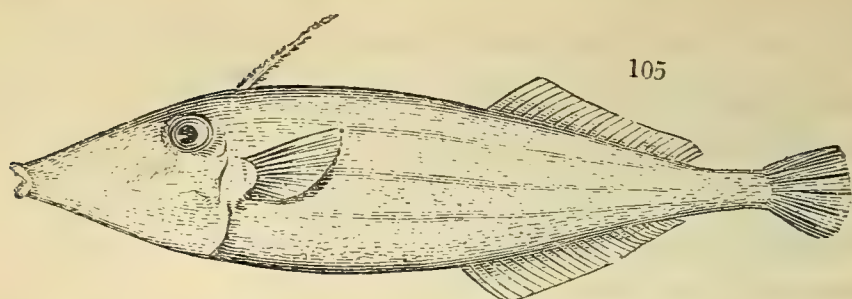
C. spinosissimus. Frey. Atl. *pennicilligerus*. Cuv. Règ. pl. 45. fig. 3—8. An. pl. 12. fig. 3.

Alutera Cuv. Body granulated, ovate, oblong ; pelvis concealed beneath the skin ; sides of the tail without spines.

A. monoceros. Bloch, pl. 147. *lævis*. Bloch, pl. 414.

punctata. Spix, pl. 76. *virida*. Frey. Atl. 472. (fig. 105.)

* Mon. *Sandwichiensis*, Quoy and Gaimard.



Trichoderma Sw. Body scored, or divided into diamond-shaped compartments, as in *Balistes*; pelvis projecting; sides of the tail with spines, and sometimes furnished with a fascicle of rough bristles.

T. scapus. Lac. i. pl. 18. f. 3. *histrix.* Sw. Gray, Ind. Zool.

3. SUBFAM. TETRAODINÆ.

Body slightly scabrous, or defended only by short prickles, more conspicuous on the lower part; belly capable of being greatly inflated; jaws sharp, cutting, each divided into the appearance of two teeth.

TETRAODON Linn. Head short; the body being entirely covered with prickles.

T. lineatus. Bloch, 141. *maculatus.* Hamilt. 18. fig. 2.
testudineus. Ib. 139. *fluviatilis.* Ib. pl. 30. fig. 1.

LEISOMUS Sw. Head short; the body entirely smooth.

T. lævissimus Sch. *marmoratus.* Hamilt. pl. 18. fig. 3.

LAGOCEPHALUS Sw. Head short; the upper parts of the body smooth; the belly armed with angulated spines, as in *Diodon*.

L. stellatus. Bl. pl. 143. *Pennantii.* Yarrell, ii. 347.

CIRRHRISOMUS Sw. Sides of the body furnished with cirriform processes.

c. Sprengleri. Bloch, pl. 144.

PSILONOTUS Sw. Fore part of the head and muzzle prolonged, narrow, as in *Balistes*; the back carinated; belly furnished with prickles.

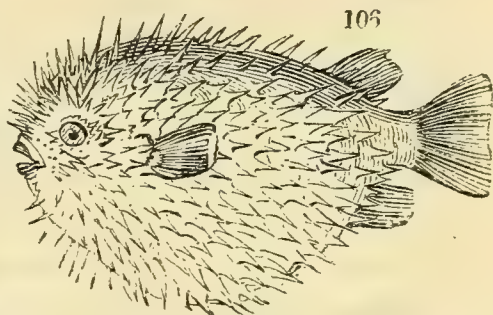
P. rostratus. Bl. pl. 146. *Electricus.* Ph. Tr. 76. pl. 3.

4. SUBFAM. DIODONINÆ.

Teeth none ; cutting margins of one or both of the jaws entire ; body more or less orbicular, and armed with spines.

DIODON Linn. Both jaws with the margins undivided ; body covered with spines.

D. hystrix. Bloch, pl. 125.
(fig. 106.)



TRIODON Cuv. Upper jaw divided at the margin into the appearance of teeth, lower entire ; belly forming an enormous bag ; body rough, as in *Tetraodon*, particularly on the belly.

T. bursarius. Reinw. Less. Atlas, pl. 4. (Vol. I. p. 197. fig. 32.)

5. SUBFAM. CEPHALINÆ. *Sun-fish*.

Body oval or orbicular ; the dorsal, caudal, and ventral fins united.

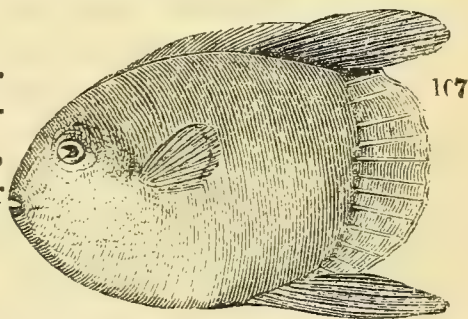
PEDALION Guilding MSS. Body rough, sub-ovate ; mouth very small ; jaws acuminate ; a six-lobed sacral appendage serving instead of a caudal fin, and disconnected to the dorsal and ventral fins ; pectoral fins short, rounded ; eyes versatile, as in *Syngnathus*.

P. gigas. Guild. (Vol. I. p. 199. fig. 33.)

ORTHAGORISCUS Sch. (fig.

107.) Body nearly orbicular ; the skin rough, but without spines or compartments.

O. mola. Bloch, pl. 128.



MOLACANTHUS Sw. Body armed with spines.

M. Pallasii Sw. Pall. Spec. Zool. pl. 4.

CEPHALUS Shaw. Pectoral fin lengthened, pointed ;

body oblong, hard, divided into small angular compartments ; connecting this group with the Ostracinae.

C. oblongus. Bl. Sch. pl. 97.

FAMILY 2. CHIRONECTIDÆ. *Frog-fish.*

Body naked, thick, heavy, generally compressed, sometimes tuberculated, but always destitute of scales ; eyes small, generally vertical, or placed near the crown ; mouth vertical, the lower jaw longest ; branchial spiracle single, placed close to the pectoral ; head generally with detached rays, or horn-like processes ; pectoral fins pedunculated, capable of being used as feet ; dorsal fin either divided or entire.

CHIRONECTUS. *Cuv.* Body naked, compressed ; mouth vertical.

C. Histrio. Bloch, 111. *pictus.* Shaw, Ichth. ii. pl. 165.

FAMILY 3. LOPHIDÆ.

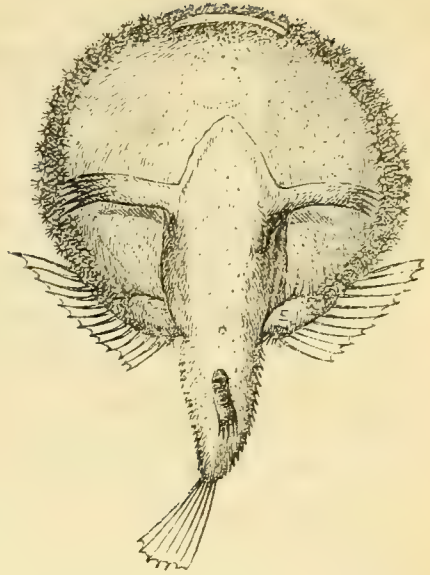
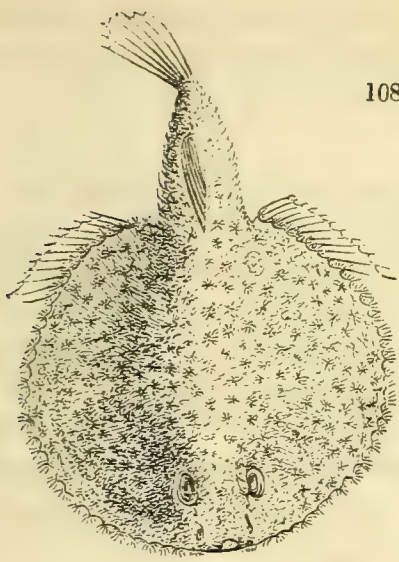
Head enormous, nearly flattened, often spiny or tuberculated ; body depressed, sometimes with pores, but never with scales ; tail small, compressed ; mouth often very wide, placed beneath the snout, and cleft horizontally ; pectorals pedunculated.

MALTHE *Cuv.* Head with a horn-like process on the snout, pointing forwards ; mouth small, slightly retractile ; hinder part of the head and the body very broad and depressed, studded with scattered tubercles.

M. nasuta. Bloch, pl. 110. (Vol. I. p. 9. fig. 1.)

LOPHIUS *Linn.* The whole of the head and body excessively broad, sometimes nearly orbicular ; head enormously large, more or less spinous, and furnished with cirri and long detached moveable rays ; dorsal fins two ; mouth very large, transverse, with acute teeth ; eyes vertical ; tail short, compressed.

L. piscatorius Linn. Bl. 87.



ASTROCANTHUS Sw. (fig. 108.) Head and body orbicular, covered with spines; mouth beneath; tail short, compressed; ventrals pedunculated, placed half way between the mouth and the pectorals; dorsal fin single, placed at the base of the tail; the general outline resembling that of *Torpedo*.*

A. stellatus Sw. Lac. i. pl. xi. figs. 2, 3.

FAMILY 4. SYNGNATHIDÆ. *Pipe-fish.*

Body slender, mailed with angular scaly plates, united at their sutures; mouth more or less elongated into a tube, at the extremity of which is the mouth, the opening being vertical; gills not pectinated, but formed into fascicles, placed in pairs on the branchial arches; the aperture forming a single spiracle.

PEGASSUS Linn. Body depressed, broad; snout suddenly contracted, narrow, more or less pointed; the mouth terminal, but placed beneath; pectorals pedunculated, very large; ventrals of a single vermiform ray; tail

* This family is very imperfectly understood; those species of Cuvier's which have scales appear to belong to the tribe *Canthileptes*. I exclude from this group all such as have not pedunculated pectorals or a spiracled aperture.

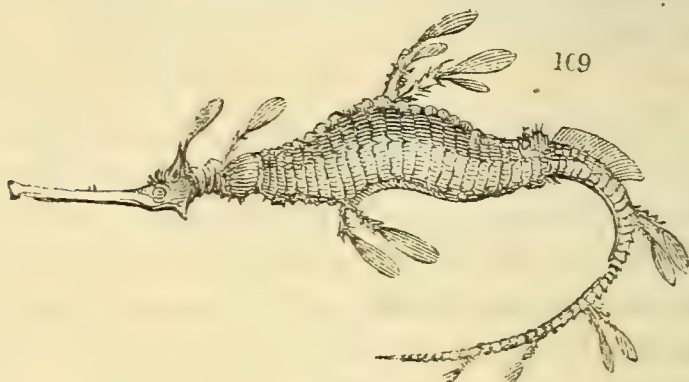
short, compressed, with a single dorsal fin at its base. and opposite the anal fin ; caudal small.

P. Draco Linn. Bloch, 109. Gron. pl. 12. figs. 2, 3.*
natans. Bl. 121.

HIPPOCAMPUS Linn. Body and head compressed and broad ; muzzle narrow, tubular ; the mouth terminal ; profile of the head angular ; dorsal fin single ; pectorals small ; caudal fin none ; anal none in the male.

H. brevirostris. Yarr. ii. 342.

Phyllopteryx Sw. Fuciform ; body broadest in the middle, and furnished with leaf-like appendages.



P. foliatus. Sw. (fig. 109.)

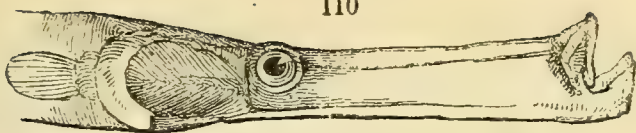
Solenostoma Lac. Caudal fin large, pointed ; ventral fins ample, united both together and to the body, beneath which the eggs of the female are placed ; dorsal fins two, the first placed close to the head, the second at the base of the tail ; snout tubular ; the mouth terminal.

S. paradoxa. Pall. Spic. Zool. 8. fas. viii. pl. 4. f. 6.

SYNGNATHUS Linn. Snout greatly elongated ; the mouth terminal, and opening vertically ; teeth none ; body very long, linear, angulated, and nearly of equal breadth, but attenuated on the tail.

Syngnathus Linn. (fig. 110.) Dorsal fin one ; ventral fins none ; caudal rounded ; males with an elongated pouch under the tail.

* This species unites in itself part of the characters of *Syngnathus* and *Astrocanthus* in a most interesting manner ; the figures of Gronovius seem to represent a different species to that of Bloch, pl. 109.



S. major. * Yarr. ii. 325.

typhle. Yarr. ii. 332.

fasciatus. Gray, Ind. Zool.

ii. pl. 89. f. 2.

Acus Will. General characters of the last, but the pectoral, ventral, anal, and caudal fins, as well as the sub-caudal pouch, are wanting.

A. equoreus. Yarr. ii. 335.

lumbriciformis. Ib. 340.

ophidion Ib. 338.

Solegnathus Sw. Resembling the two last in general shape, but there is no caudal fin; tail shorter than the body; the pectorals rather large; anal fins small.

S. Hardwickii. Gray, Ind. Zool. i. pl. 89. f. 3.

ORDER V. APODES. *Eels, Lampreys, &c.*

Body eel-shaped, or anguilliform †; ventral fins none; branchial orifice of one or more spiracles; operculum, when present, concealed and covered by the common skin.

FAMILY 1. MURÆNIDÆ. *Eels.*

Body serpentiform; scales very small, enveloped in a mucous epidermis; ventral fins and cœca wanting; branchial spiracles two, lateral, placed one on each side.

ANGUILLA Antiq. Dorsal, anal, and caudal fins united into one; pectoral fins oval; the branchial opening transverse behind.

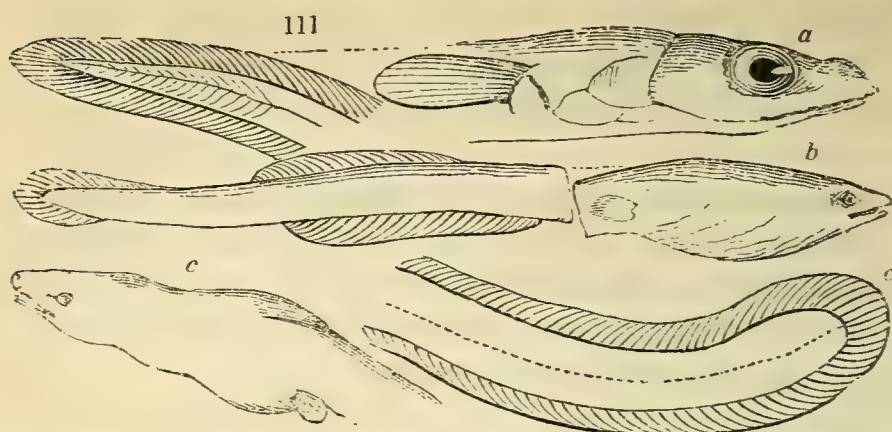
Anguilla Linn. Spiracles placed just beneath the base of the pectoral; dorsal fin commencing behind the pectorals; lower jaw often longest; nostrils tubular.

Muræna anguilla Linn.

M. conger. Bloch, pl. 155.

* This is the *S. Acus* of most writers; but, as I have thought it advisable to follow Willughby in applying this name to the next sub-genus, it seems desirable, to prevent confusion, not to use it also in a specific sense in this.

† Except the family of *Cyclopteridæ*, which unites this order to that of *Plectognathes*.



Ophisoma Sw. (fig. 111. a.) Resembling the last, but the transverse spiracles are placed in front of the base of the pectorals ; nostrils not tubular.

obtusum Sw. Appendix.

acuta Sw. App.

Ophisurus Lac. General structure of *Anguilla* ; but the dorsal and anal fins terminate at the extreme tip of the tail, which is naked and pointed.

O. pictus. Sw. App.

immaculata. Gray, Ind. Zool.

puncticulata. Ham.

i. pl. 91. fig. 1.

fig. 5.

acuminata. Ib. 91. fig. 2.

Leptognathus Sw. Jaws greatly prolonged, attenuated, and pointed ; the sides armed with large, scattered, acute teeth, pointing backwards, with others, much smaller, interspersed ; nostrils simple ; gape very wide ; spiracle placed transversely in front of the pectoral ; dorsal and anal widening at their extremities, and terminating before the end of the tail, which is naked and obtuse.

L. oxyrhynchus Sw. app. (Vol. I. p. 221. fig. 42.)

Pterurus Sw. (fig. 111. b.) Mouth small ; dorsal and anal fin rather short, placed near the caudal fin and the vent, which is very remote from the head ; caudal fin distinct, and encircling the end of the tail, which is obtuse.

P. maculatus. Ham. p. 25.*

triporosa. Russ. i. No. 34.

Hardwickii. Gray, Ind. Zool.

* *Muraena raitabori* a of Hamilton.

MURÆNA *Antiq.* Pectoral fins very minute, or wanting ; spiracles placed on the sides of the head.

Nettastoma Raf. Jaws much lengthened, obtuse ; muzzle slightly depressed above ; branchial apertures tranverse, placed beneath the neck ; dorsal, anal, and caudal fins united ; gill-membrane without rays ; no operculum ; branchial arches two.

N. melanura. Raf. *Carat.* p. 66. pl. 16. fig. 1.

Pachyurus Sw. (*fig. 111. c c.*) Body very slender ; pectoral fins very minute ; tail much shorter than the body, very obtuse, and rather thickened at the extremity ; dorsal fin commencing behind the vent, and shorter than the ventral fin, and both uniting with the caudal.

P. linearis. Gray, *Ind. Zool.* i. pl. 95. fig. 3.

Muræna *Antiq.* No pectoral fins ; dorsal generally commencing at the back of the head, and uniting to the caudal and anal ; tip of the tail pointed ; nostrils tubular ; teeth various.

M. helena. Bloch, pl. 152. *rostratus.* Spix, pl. 50 *a.*
ocellatus. Spix, pl. 50 *b.*

Dalophis Raf. No pectoral fins ; spiracles placed very low, towards the sides of the throat ; dorsal and anal fins terminating before they reach the end of the tail, which is naked ; body cylindrical ; mouth small, with minute sharp teeth ; nostrils tubular ; dorsal fin commencing a little behind the head ; vent nearly central ; upper jaw much longer than the under.

D. serpa. Raf. *Carat.* p. 69. (Vol. I. p. 224. fig. 45.)

OPHIOGNATHUS *Harwood.* Pectoral fins and the branchial aperture very small, the latter placed beneath ; body capable of being inflated, like a thick tube ; tail very long and slender, surrounded by a narrow dorsal and anal fin, which unite ; mouth very wide, armed with sharp teeth ; eyes placed close to the sharp point of the muzzle.

O. ampullaceus. Harwood, *Ph. Tr.* 1827.

ICHTHYOPHIS *Lesson*. Body cylindrical ; spiracles lateral, one on each side of the head ; mouth rather large ; teeth acute ; eyes moderate ; no fins whatever.

I. pantherinus. Less. Atl. pl. 13. *tigrinus*. Ib. pl. 12.

ALÆBES *Cuv*. A single spiracle, as in the last, but the pectoral fins distinct, between which is a small concave disk ; a small operculum and three rays are distinguishable through the skin by which they are enveloped. India. (One species, not described.)

FAMILY 2. SYNBRANCHIDÆ.

Body eel-shaped ; spiracles placed under the neck.

Sphagebranchus *Bloch*. Snout lengthened and pointed, projecting beyond the mouth ; the dorsal and anal fins only apparent towards the tail ; branchial spiracles close together under the throat ; pectoral fins often obsolete or entirely wanting.

S. rostratus. Bloch, pl. 419. fig. 2.

MONOPTERUS *Comm*. Dorsal and anal fins commencing on the middle of the tail, and united at its point ; branchial orifices united under the throat in a transverse cleft, but divided in the middle.

M. Javanensis *Lac*.

SYNBRANCHUS *Bloch*. A single small round branchial aperture or spiracle placed under the throat ; the dorsal and ventral fins meeting, and continued round the pointed end of the tail ; pectoral fins none.

S. marmoratus. Bloch, 418. *cashia*. Buch. pl. 16. fig. 4.

OPHICHTHYS *Sw*. Spiracle single, placed under the throat ; body entirely without fins, cylindrical, and without scales ; snout depressed, short, obtuse ; under jaw shortest ; nostrils simple, near the tip of the snout, and single ; eyes small ; tail compressed at the tip.

O. punctatus. Ham. pl. 16. fig. 4. (*Cuchia*.)

FAMILY 3. STERNARCHIDÆ.

Body linear, anguilliform, but compressed, and often with small scales.

Gymnotus Bloch. Branchial aperture before the pectorals ; anal fin very long, and reaching to the end of the tail ; dorsal fin wanting.

G. electricus Bloch, 156.

Gymnarchus Cuv. Body elongated, scaly ; gills only slightly open ; head conic, naked ; mouth small, with a single row of small cutting teeth ; dorsal fin very long, the rays soft ; anal fin none ; tail pointed.

G. niloticus Cuv.

CARAPUS Cuv. Body and head compressed, as in ordinary fishes ; tail very long and gradually attenuated ; gill-covers distinct ; pectoral fin present ; anal fin narrow, and reaching to the point of the tail ; dorsal, caudal, and anal fins wanting.

C. brachyurus, Bloch, pl. 157. fig. 1. *macrourus*, Ib. fig. 2.

Sternarchus Sch. General habit of the last ; head oblong, compressed, naked ; the skin concealing the opercula ; body scaly ; teeth close, even ; anal fin distinct from the caudal.

S. albifrons, Pallas. Sp. Zool. pl. 6. fig. 1.

LEPTOCEPHALUS Pal. Body greatly elongated, and remarkably compressed ; head very small ; snout short, and somewhat pointed ; pectoral fins very small ; caudal, dorsal, and anal fins united.

L. Morrisii. Yarrell, Brit. F. pl. at page 311.

FAMILY 4. PETROMYZONIDÆ. *Lampreys*.

Body elongated ; eyes very small or none ; mouth circular, placed beneath the head and opening by a longitudinal fissure ; skeleton soft, almost mucilaginous ; branchial spiracles two or more.

AMPHIOXUS Yarrell. Body compressed, lanceolate, hyaline ; a single dorsal fin the whole length of the

back ; no pectoral, ventral, anal, or caudal fins ; mouth narrow, elongated, the margins furnished with slender filaments.

Amph. lanceolatus. Yarrell, ii. 468.

PETROMYZON Linn. Body cylindrical ; eyes small ; branchial spiracles seven on each side.

Petromizon proper. Mouth circular, armed with hard tooth-like processes in several rows.

P. marinus Linn. Yarrell,
ii. 448.

fluviatilis Linn. Yarrell,
ii. 454.

Heptatremus Dum. Teeth in two rows ; tail rounded at the extremity, and terminated by a very narrow fin.*

Ammocetes Dum. Lower lip straight and transverse ; teeth none.

A. branchialis Dum. Yarrell, ii. 459.

MYXINE Linn. Body cylindrical ; eyes none ; branchial apertures two ; dorsal fin linear, and very narrow ; lips surrounded with cirri.

M. glutinosa Linn. Bloch, pl. 413.

FAMILY 5. CYCLOPTERIDÆ. *Suckers.*

Cartilaginous ; without scales ; body slimy ; pectoral fins very broad and uniting with a transverse membrane connecting the ventrals ; branchial spiracle one ; eyes on each side, approximating.

LEPIDOGASTER Gouan. Size small ; body rather slender ; head heart-shaped, much depressed ; the ventral membrane extends round the pelvis, forming a concave disk, a second disk is placed behind ; dorsal fin one, detached from the caudal, and of the same length as the anal.

L. cornubicus Yarrell.

Piecephalus Raf. “ Body conic-compressed ; pectoral

* The characters of this supposed sub-genus are so slightly given in the *Règne Animal*, that, not having seen the original description, we scarcely venture to adopt it.

fins united beneath on the throat to a transverse disk or plate ; ventral fins united to a second semicircular plate, whose concavity is turned upwards towards the head, and furnished with cup-shaped suckers ; dorsal fin opposite the anal ; vent nearest to the tail ; teeth sharp, in different rows, the anterior longest ; caudal fin emarginate."

P. adherens. Raf. Carat. p. 63.

RUPISUGA *Sw.* General structure of the last, but the caudal, dorsal, and anal fins are united.

L. nicensis Sw. Risso, pl. 4. fig. 10.

GOBIESOX *Lac.* Branchial aperture rather larger ; ventral disk one ; dorsal and anal fins short, and distinct from the caudal.

G. bimaculatus. Penn. Brit. Zool. pl. 22. fig. 1.

CYCLOPTERUS *Linn.* Body short, thick, viscous, without scales, but with rows of thick conical tubercles ; branchial aperture very small ; dorsal fin one, corresponding to the anal ; pectorals large, almost uniting under the throat, and with the ventrals, which form an oval concave disk.

C. Lumpus. Bloch, 90.

LIPARIS *Artedi.* Body smooth, lengthened, subanguilliform ; dorsal fin long, united to the base of the caudal ; head thick ; tail compressed.

L. ophidoides. Yarrell, B. Fish, ii. 274.

CHAP. III.

A NATURAL ARRANGEMENT OF THE CLASS AMPHIBIA, ACCORDING
TO PROFESSOR BELL.

ORDER. I. AMPHIPNEURA.

Body elongate, formed for swimming ; feet either two

or four ; tail compressed, permanent ; branchia external, permanent ; lungs rudimentary.

PROTEUS Laur. Anterior feet with three toes ; posterior with two only, and all the legs very small ; tail vertically compressed, the edges fin-like ; muzzle lengthened and depressed ; eyes excessively small, nearly concealed by the common skin.

P. anguinus. Laur. pl. 4. fig. 4.

SIREDON Wagl., Axolet. Anterior feet with four, posterior with five, toes ; resembles in many respects the larva of an aquatic salamander.

S. pisciformis. Gen. Zool. iii. pl. 140.

MENOBANCHUS Harlan. Each of the feet with four toes.

M. lateralis Harl.

SIREN Linn. Body anguilliform ; no hind feet ; mouth small ; eyes minute ; ears concealed ; teeth only in the lower jaw ; anterior feet small, with four toes ; tail compressed.

S. lacertina Linn.

Pseudobranchus Gray. General structure of Siren, but with three toes only on the anterior feet.

P. striata Gray. (Siren striata Leconte.)

ORDER II. ANOURA.

Body short and broad ; metamorphous ; complete ; larva or tadpole without feet, but with a compressed tail and external branchia ; the perfect or adult animal with four feet, no tail, and internal branchia.

RANA Linn. Terrestrial Frogs. All the toes simple, neither dilated at their extremities, or furnished with nails ; mouth toothed ; feet, especially the hinder, very long ; skin smooth ; tongue and tympanum distinct.

R. esculenta Linn. The common frog.

Hyla Laurenti. *Tree Frogs.* Toes dilated at their extremities.

Hyla arborea Laur. Roesel. pl. 9, 10.

Ceratophrys Boie. *Horned Frogs.* Above the eyes a horn-like prominence ; toes pointed.

C. varius. B. Seba, i. pl. 72. figs. 1, 2.

BUFO Laurenti. *Toads.* Body thick, tuberculated ; hinder feet not very long ; teeth none ; nose rounded ; tongue and tympanum distinct.

B. vulgaris. Ræs. pl. 20.

RHINELLA Fitz. muzzle pointed ; head rounded behind.

R. proboscideus. Spix, pl. 21. fig. 4.

OTILOPHA Cuv. Muzzle angular ; head with a crest on each side, extending over the parotid.

O. margaritifera. Daud. 33.

DACTYLETHRA Cuv. Toes pointed, the hinder ones widely palmated, the three internal ones with their extremity enveloped in a conical, corneous, black substance.

D. lævis. Daud. pl. 30. fig. 1.

BOMBINATOR Merr. Mouth large ; eyebrows rounded ; no claws upon the toes ; tympanum concealed.

B. bombina. Daud. 26.

BREVICEPS Merr. Head and mouth very small ; feet semi-palmated only ; toes five, four ; tympanum and parotid concealed.

B. gibbosus. Daud. pl. 29. fig. 2.

BRACHYCEPHALUS Fitz. Three toes only on the feet.

B. Ehippium. Spix, pl. 20. fig. 2.

PIPA Daud. Body flattened above ; head large and triangular ; tympanum concealed ; each of the anterior toes divided at the tip into four points.

P. Surinamensis. Daud. 31, 32. *sternalis.* Spix, pl. 22.

ORDER III. URODELA.

Body long, slender ; feet always four ; tail long, permanent, with external branchia in the young, and cellular lungs in the adult state.

SALAMANDRINA *Savi.* General structure of Salamandra, but there are only four toes upon all the feet.

S. perspicillata Sav.

SALAMANDRA. *Terrestrial Salamanders.* Four toes on the anterior, and five upon the hinder feet ; head flattened ; tail rounded ; aquatic in their tadpole or larva state, but terrestrial in the adult.

S. maculosa. Lac. ii. pl. 30.

Tritonella *Sw.** *Aquatic Salamanders.* Toes as in Salamandra ; but the tail is much compressed, and surrounded by a narrow fin.

T. Gesneri Laur.

MOLGE *Merrem, Gray.* Toes long and free ; skin and parotoids smooth, minutely punctured ; lateral line none.

Al. glutinosa Gray. (Salamandra glutinosa Green.)

ORDER IV. ABRANCHIA.

Aquatic ; body long ; feet four ; respire by lungs only ; branchial none ; cranium solid ; no metamorphoses known.

MENOPOMA *Harlan.* General form of a salamander ; body sub-cylindrical ; tail compressed ; eyes very small ; legs rather strong ; toes four, five ; feet externally fringed.

M. gigantea. Griff. Cuv. p. 410.

AMPHIUMA *Garden.* Body excessively lengthened ; legs

* As the name of *Triton* has long been given to a well-known genus of shells, perhaps *Tritonella* may serve our turn on this occasion.

and feet very small, rudimentary ; the number of toes variable in the species.

A. tridactylum Cuv.

means *Garden*.

ORDER V. APODA.—(*Bell.*)

No feet or branchia ; body elongated, slender, anguilliform ; tail very short, almost wanting.

CÆCILIA. Sternum wanting ; lungs unequal ; ears concealed.

CHAP. IV.

A SYNOPSIS AND NATURAL ARRANGEMENT OF THE CLASS OF REPTILIA.

SYNOPSIS.

ORDER I. EMYDOSAURES. *Crocodiles.*

Body plaited ; tail long ; feet palmated.

CROCODILUS. Lower canines received into the upper.

CHAMPSA. Lower canines received into pits.

STENOSAURUS. Jaws very long, narrow, and cylindrical.

ORDER II. CHELONIDES. *Tortoises.*

Limbs capable of being withdrawn into a shell-like covering which protects the body.

FAMILY 1. CHELIDRIDÆ. *Crocodile Tortoises.*

Tail long ; head not retractile.

CHELYDRA. Tail long, with crests of scales.

PLATYSTERNON. Tail long, without crests; head large and broad.

CHELYS. Nostrils much lengthened and tubular; head and neck with lobed appendages; tail short.

FAMILY 2. TESTUDINIDÆ. *Land Tortoises.*

Feet club-shaped; toes very short, united as far as the claws.

TESTUDO. Sternum immovable.

CHERSINA. Hinder part of the sternum movable.

HOMOPUS. Each foot with four toes and claws.

PYXIS. Anterior part of the sternum movable.

KINIXYS. Posterior part of the sternum movable; hinder feet with only four claws, fore feet with five.

FAMILY 3. EMYDÆ. *River Tortoises.*

Tail short; the toes distinctly separated, but united by a web.

CISTUDA. Sternum very wide, the two divisions movable.

EMYS. Sternum immovable.

KINOSTERNON. Sternum rounded in front, of eleven plates; symphyses narrow.

Sternotherus. Sternum wide, the front lobes moveable; jaws horny.

CHELODINA. Neck remarkably long.

HYDRASPIS. Sternum narrow, solid; nostrils short and tubular.

FAMILY 4. TRIONYCIDÆ. *Soft Tortoises.*

Shell soft, covered with a skin; claws only three.

TRIONYX. Sternum narrow; shell margin cartilaginous.

EMYDA. Margin of the shell with small bones.

FAMILY 5. CHELONIDÆ. *Sea Turtles.*

Feet fin-shaped.

CHELONIA. Shields hard, naked.

SPHARGIS. Shell covered with a coriaceous skin.

ORDER III. ELANOSAURES. *Fish Lizards.*

Body lacertiform ; feet fin-shaped ; jaws exceedingly long.

Plesiosaures. Neck excessively long ; jaws short.

Ichthyosaures. Jaws very long ; neck short.

Saurocephalus. Incisors with a hole on the inner edge of the alocola.

Pterodactylus. Jaws excessively long ; feet furnished with toes, the anterior wing-like.

ORDER IV. OPHIDES. *The Serpents.*

Feet none.

FAMILY 1. HYDROPHIDÆ. *Water Serpents.*

Body and tail compressed ; nostrils operculated ; anal spurs none ; upper jaw with poisonous fangs.

HYDRUS. Head small, not enlarged behind ; plaited.

PELAMYS. Head enlarged behind ; scales small, hexagonal.

CHERSYDRUS. Head and body with small carinated scales.

ACHROCORDUS. Like the last, but the tail is not compressed.

HERPETON. Head with two soft scaly tentacula.

PSEUDOBOA. Head enlarged behind, plaited ; back carinated.

FAMILY 2. CROTALIDÆ. *Poisonous Serpents.*

Upper jaw with poisonous fangs ; tail cylindrical.

CROTALUS. Tail ending in a rattle ; scales similar on the head and back.

Caudisona. Like the last, but with plates on the head.

TISIPHONUS. Tail ending in a spine or sting ; head with plates.

CRASPEDOCEPHALUS. Head scaled ; sub-caudal plates double.

COPHIAS *Merr.* Head broad behind, large, scaled ; tail simple.

Trigonocephalus. Head with plates.

CERASTES. Head broad, covered with scales or plates ; no depression behind the nostrils.

Cerastes. Scales of the head and back similar ; nostrils large, simple.

Berus. Head with granular scales ; sub-caudal plates double.

Echis. Head with small scales ; sub-caudal plates single.

Acanthopis. Tail with a hook ; front scaled.

NAIA. Head with large regular plaits.

Naia. Neck capable of being dilated ; head narrow.

Lepidon. Neck not expansive ; head broad.

Elaps. Head narrow ; dorsal scales equal.

PLATURUS. Body cylindrical ; tail compressed.

Trimesurus. Head distinct ; tail conical ; caudal plates double and single.

Oplocephalus. Like the last, but the caudal plates simple.

FAMILY 3. COLUBERIDÆ. *Snakes not poisonous.*

Lower jaw mobile; fangs small, or none.

COLUBER. Anal spines none; ventral plates broad.

Coluber. Head moderate; nose rounded.

Heterodon. Nose acute and recurved.

SPILETES. Scales in long series; abdominal plates recurved; mouth very small.

ZENODON. Tail short; head large, distinct; mouth very wide.

Oligodon. Head short, obtuse, narrow.

Erpetodryas. Tail long; head lengthened, distinct; mouth very wide.

HURRIA. Tail conical, anterior caudal plates single, posterior double.

LIOPHIS. Head hardly distinct; mouth small; hind teeth large.

Calamaria. Head not distinct; tail very short; caudal plates entire.

Brachyorrhos. Resembles the last, but the eyes are very small.

Lycodon. Scales nearly square; body long, sub-compressed.

Zenopeltis. Nose rounded; head plates triangular.

Scytale. Head ovate, indistinct, plated; scales equal.

DRYINUS. Head long; muzzle acute; tail long; scales equal.

Passirita. The dorsal scales triangular, the lateral linear.

Leptophis. Like Dryinus, but the muzzle rounded and obtuse.

AMBLICEPHALUS. Head high, plated before; body compressed.

DIPSAS. Head short, broad; body compressed; vertebral scales square.

Cerebus. Head with small scales, and plates before and between the eyes.

BOA. Vent with two spurs; tail prehensile; caudal plates simple.

Boa. Muzzle with scales; labial scales variable.

Eunectes. Muzzle with plates instead of scales.

PYTHON. Small plates on the fore part of the head.

Cenchrus. Head truncate before and behind; caudal plates simple.

Python. Resembles the last, but the caudal plates are double.

Gonylophis. Scales of the head and back similar and carinated.

Eryx. Head with small scales; tail short, obtuse; no anal spines.

FAMILY 4. ANGUIDÆ. *Slow-worms.*

Head and body with smooth imbricate scales.

PSEUDOPUS. Tubercles at the anus; scales square, thick.

OPHISAURUS. Like the last, but without anal tubercles.

ANGUIS. Body entirely smooth, surrounded with imbricate scales.

Acontias. Tail short; no rudiments of feet externally or internally.

FAMILY 5. AMPHISBÆNIDÆ. *Blind-worms.*

Body cylindrical; the scales forming rings; tail very short, thick, obtuse; eyes minute or concealed.

AMPHISBÆNA. Scales quadrangular ; anus with pores.

Leposternon. Resembles the last, but the muzzle is advanced ; thoracic rings irregular.

TYPHLOPS. Eyes hardly visible ; scales imbricate ; front plated.

Stenostoma. Muzzle depressed, obtuse.

Typhlops. Muzzle with a single frontal sharp-edged plate.

Rhinophis. Muzzle pointed ; tip of the tail with a horny shield.

Typhlina. Muzzle with a single plate ; tail spined ; eyes none.

ANILIUS. *Coral Snakes.* Body and head cylindrical, with small imbricate scales, those beneath rather larger.

Anilius. Tail obtuse ; a single row of larger beneath.

Uropeltis. Head small ; muzzle pointed ; tail obliquely truncate.

ORDER V. SAURES. *The Lizards.*

Body covered with scales ; feet four, rarely two, with toes.

FAMILY 1. CHAMÆLIONIDÆ.

Toes scansorial, syndactyle, divided into two portions ; tongue excessively long, vermiform, the tip enlarged and obtuse ; tail prehensile.

Chamæleon Linn.

Sub-genera : *Triceros*, *Diceros*.

FAMILY 2. IGUANIDÆ. *Thick-tongued Lizards.*

Tongue thick, not extensible, and only notched at the tip ; palate furnished with teeth ; neck narrower than the head, which is more or less widened behind.

POLYCHRUS *Cuv.* Tail long, slender, and smooth, more or less prehensile ; body smooth, without a dorsal crest ; throat pouched ; palate generally furnished with teeth : representing the chameleons.

Sub-genera : *Norops**, *Læmanetus*, *Urostrophus*, *Polychrus*, *Brachylophus*.†

IGUANA *Daud.* Head, body, and tail more or less compressed, and armed with a dorsal range or crest of spines ; throat with a pouch ; toes simple.

Sub-genera : *Ophryaessa*, *Iguana*, *Basaliscus*, *Amblyrhynchus*, *Aloponotus*.

STELLIO *Daud.* Head and body more or less depressed, the

* Connects this genus to *Anolis*.

† Connects *Polychrus* to *Iguana*.

former broad behind ; tail armed with verticillated rings of spines ; no palatine teeth.

Sub-genera : *Stellio*, *Uronomastrix*, *Cyclura*, *Phyllurus*.*

PLATYDACTYLUS *Cuv.* Head and body greatly depressed ; toes nearly equal, more or less united and dilated into disks.

Sub-genera: typical—*Platydactylus*, *Hemidactylus* : aberrant—*Ptilodactylus*, *Sphærodactylus*, and *Phyllodactylus*.

ANOLIS† *Merr.* Throat with an enormous extensible pouch ; head and body not depressed ; belly and tail with small imbricate scales‡ ; a single disk upon the toes. §

Sub-genera : *Stenodactylus*, *Dactyloa*, *Xiphosurus* and *Anolis*. ||¹

FAMILY 3. LACERTIDÆ. *Slender-tongued Lizards.*

Tongue very long, slender, and deeply forked ; no gular pouch, or dorsal crests of spines on the tail or body ; neck thick ; head small, pyramidical, not dilated behind.

HYDROSAURES¶ *Wag.* Scales imbedded in the skin, and separated from each other ; tail long, compressed, carinated, with a double crest ; toes long, unequal.

Sub-genera : *Veranus*, *Hydrosaurus*, *Empagusia*.

HELODERMA** The scales of the body resembling detached shield-like plates ; tail rounded, moderate, not crested ; the middle toe longest ; tongue ——— ?

Sub-genera : *Heloderma*.

LACERTA. Head pyramidical, narrow behind ; tail long, almost always rounded ; the scales smooth.

Sub-genera : *Ameiva*, *Lacerta*, *Scapteira*, *Acranthos*, *Dracæna*.

ZONURUS. “ Head depressed, broad behind, with whorls of large keeled spinous scales.”

Sub-genera undetermined.

LEIOLEPIS.†† Lizard-shaped ; tongue scarcely extensible, the tip slightly forked and squamose, the hinder portion papillose ; tail very long, with whorls of small, carinated, but not spinous scales.

Sub-genera : *Leiolepis*.

* The last sub-genus, *Phyllurus*, unites this group to the *Platyductili*.

† This genus, passing into that of *Polychrus*, completes the circle of the *Iguanidæ*, which stands the first in our series.

‡ By this character they preserve their representation to the *Agamidæ*.

§ Except in *Stenodactylus*, which unites this genus with the last.

|| *Anolis*, passing into *Polychrus*, completes the circle of this family.

¶ This group seems to pass into the *Scincoidæ* by means of Mr. Gray's new genus *Empagusia*, which I have placed on the confines of that family.

** Representing the tortoises and the *Agamidæ*.

†† Forming the passage between the slender and the thick tongued lizards or *Iguanidæ*.

FAMILY 4. AGAMIDÆ.

Belly and tail entirely covered with small imbricate scales; palatine teeth none*; tongue thick, not extensible; toes simple, free, unequal; body and tail more or less depressed.

LOPHIURA Gray. Tail very long, compressed, and carinated with spines, which extend on the ridge of the back, and are generally large upon the nape.

Sub-genera: *Istiurus*, *Lophyura*, *Calotes*, *Lophyrus*, *Lyriocephalus*.

DRACO Linn. Skin of the throat either excessively enlarged, or the sides furnished with wing-like expansions.

Sub-genera: *Sitana*, *Clamidosaures*, *Draco*.

AGAMA Daud. Tail long, slender, more or less rounded; no crest of spines on the back, head, or tail; head depressed and enlarged behind.

Sub-genera: *Agama*, *Trapelus*, *Ceratophorus*, *Grammotophora*.

PHRYNOSOMA Wagler. Body and head flattened, the former wide, and nearly orbicular; tail short, depressed, rough; no dorsal or caudal crests.

Sub-genera: *Phrynosoma*, *Megalochilus*, *Phrynocephalus*, *Tropidolepis*, *Callisaurus*.

TROPIDURUS Weig. Palate furnished with teeth; head and scales somewhat resembling the skinks.

Sub-genera: *Tropidurus*, *Leiolæmus*.

FAMILY 5. SCINCOIDÆ. *Skinks*.

Feet in general very short, often rudimentary; body smooth, without crests or spines; scales shining, as in serpents.

SCINCUS. The four feet with perfect toes, as in *Lacerta*.

Sub-genera: *Scincus*, *Trachydosaurus*, *Tiliqua*, *Gymnothalmus*.

SEPS. Body serpent-like; feet very small, remote, with either three or four toes; ears distinct; scales imbricate.

Sub-genera: *Lygosoma*, *Seps*.

CHALCIDES. Scales rectangular; legs four; toes variable.

Sub-genera: *Chalcides*.

OPHIODES. Feet rudimentary; the toes undivided.

Sub-genera: *Ophiodes*, *Bipes*.

CHIROTES. Feet only two; anterior scales verticillated.

Sub-genera: *Chirotes*.

* Except in such as pass into those *Scincoidæ* which have palatine teeth.

A NATURAL ARRANGEMENT OF THE CLASS

REPTILIA.

INTRODUCTORY OBSERVATIONS.

(169.) IN the state of our knowledge of the class *Reptilia*, there is something so peculiar, that we must pause to make some observations upon it. Notwithstanding that it is, without exception, the least inviting of all the different branches of Natural History — having neither popular interest, practical use, or individual beauty to recommend it, — Erpetology has nevertheless received more attention, and has been more minutely studied, than any one division of the animal kingdom. In this the naturalists of Germany and of France have taken the lead, and their researches have been so assiduous and profound in the investigation of structure and of specific differences, that, upon these points, they have left little or nothing to be done by those who may come after them. But it has been truly observed by a well-known entomologist of this country, when speaking of the comparative merits of Cuvier and Lamarck, “that the disposition or ability to make use of such materials, to give them the proper form and polish, is not, it seems, a necessary concomitant to skill in extracting them, or to the patience required before they could be collected for use.” And hence it is, that with the most ample materials, and the most thorough knowledge of forms and species, which the distinguished writers to whom we allude obviously possess, it may be safely asserted that the *natural arrangement* of the reptiles is precisely in the same state as it has ever been, that is, entirely unknown, — and that it is consequently less understood than any other division of the animal kingdom.

(170.) The most unscientific person is aware that analysis and generalisation are two branches of knowledge, which, although absolutely essential to combine for the discovery of truth, relate to different operations of the mind; for each may be pursued independently of the other. In the first, the mental energies, as it were, are concentrated, nay, even contracted, to the individual object before it. In the second, the very reverse of this takes place: the mind, duly informed upon the general, not the specific or individual features, is called upon to expand; and, from a variety of objects, to discover those occult or general principles of union or variation which pervade through large assemblages. In the former of these inquiries, as we have just observed, every thing has been done; in the latter, comparatively nothing. To divide and subdivide merely for the sake of division, or to facilitate research, is a very different thing from doing the same with an ulterior object.* Now the ulterior object which every great zoologist aims at, is the discovery of the series of nature, or, in other words, the natural system. It might, therefore, have been supposed that the erpetologists of Germany, a country which gave birth to the illustrious Fries †, would have imbibed something of his generalising spirit; and that they would have constructed their systems, however different from each other, with some reference to the theory of their countryman, or at least to those innumerable resemblances which were to be found in this class of animals, no less than in all others. But not the least trace of any such intention, or of any such enlarged views, so far as we can discover, can be found in their writings. They have, indeed, constructed numerous divisions, but so far as regards any mutual or reciprocal relations be-

* The division and arrangement of the marsupial and the ruminating quadrupeds, is a favourite theme with our young nomenclators, who generally put forth a new one in the periodicals every six months, founded upon some fresh bone or anatomical peculiarity. All enlarged views of natural arrangement appear above their comprehension, and are therefore deemed perfectly visionary. How, indeed, can it be otherwise, when they limit their attention to a speck only in the vast field of animal life.

† See Preliminary Discourse, p. 92.

tween these divisions, they can see none. Their systems are like the winding galleries and intricate labyrinths of antique mansions, — leading to nothing. But this, unfortunately, is not all. Had the labours of these writers been confined merely to the discrimination of forms, and the separation of small natural groups, all would have been well, and we could have spoken of their labours with unalloyed praise ; but, in their zeal to excel each other in the precision of their characters, each has thought it necessary to go beyond the other. The grand and judicious divisions of Cuvier facilitated research, but those of the German school have a directly contrary effect : natural genera have been now so repeatedly divided and subdivided, that all the original and tangible characters have been frittered away into minute divisions, which they exalt to the rank of genera ; but which, in three instances out of five, contain a single species ! With them the form of a scale, or the absence of a pore, constitutes a genus. But let us take an instance, at random, of this mode of division, and we will select it from the valuable work of two of the most eminent erpetologists of the age, who in many instances, much to their honour, have purged the science of these frivolous or *pseudo-genera*. The Iguanian lizards of MM. Dumeril and Bibron contain no less than forty-seven genera, each of which is considered of the same rank : now if we subtract one of these, the genus *Anolis*, we find that in the whole of the remaining forty-six there are actually but 121 species *, and that out of this number twenty-two are made to represent genera ! Had these authors adopted all the divisions of their predecessors, it is probable that their forty-seven genera would have been at least doubled. We merely conjecture this from the simple fact of the prince of Musignano having been at the trouble to enu-

* These species are thus distributed : —

3 genera have 10 species.

1 “ “ 8 “

1 “ “ 7 “

2 “ “ 5 “

2 genera have 4 species.

5 “ “ 3 “

10 “ “ 2 “

22 “ “ 1 “

merate no less than nineteen*, which have been made out of the Gecko lizards (*Platydictylus* Cuv.), but which our authors, upon assigned reasons, have most judiciously reduced to seven.†

(171.) It may, indeed, be urged in support of “making” new genera, that those who complain against it are generally those who have most offended in this way, and that consequently we are the last who should object to the practice in others; having characterised more new groups unnamed among the vertebrated animals than all the other naturalists of this country put together. But this reply, however correct in one sense, does not meet the question. Out of between one and two hundred which we have thought it necessary to name, not one has been admitted which did not bear upon our primary object, that is, of distinguishing one type of form from another; had these types, therefore, not been so named, they could not have been spoken of, or referred to, with that precision which is absolutely necessary for their becoming “instruments of reasoning.” Not one, in short, has been named, but after as complete an analysis of the group they belonged to, as we were capable of giving. Among the woodpeckers, for instance, we have characterised no less than twenty-one sub-genera, and yet each of these has its representative in five different circles of the same family; so that, if one is subtracted, without a substitute, it would be like separating the links of a graduated chain, by the removal of one which rendered that gradation perfect. To genera or sub-genera, founded upon such considerations, we ever have been, and shall be, a warm advocate, let their number be what they may; but we feel it would be altogether inconsistent with all we have done or said, to adopt every genus which every one may choose to make, on no other grounds than his own individual opinion.

* The addition of *Pristurus*, proposed by himself, will make the number exactly twenty. This name, by the way, has been previously used to designate a supposed new genus of shark.

† Two of these, not having disk-like appendages, do not appear to enter into the circle, but to be the connecting links with *Stellio* and *Anolis*.

(172.) But the evils of the German school of nomenclature does not rest here ; inconvenient, perplexing, and confounding as these minute divisions unquestionably are, they are often rendered perfectly unintelligible ; and this in two ways. First, almost every one of these writers thinks himself at perfect liberty to set aside the nomenclature of his predecessors, however unobjectionable, and to make an effort to substitute a new name of his own.* Hence every new system brings with it a new set of names, not merely for the “ newly established ” genera, but for the old ones also. Thus it is that the nomenclature of erpetology is the most inconstant and the most fluctuating of any in the whole range of zoological science. In other branches it is universally the custom to retain the original name of the group, and to give new ones to its new divisions. Not so, however, among the reptiles and the ruminants. The authors we are speaking of think it as necessary to overthrow an old name as to invent a new one. How this will finally terminate is quite clear. The evil, if it has not yet reached its greatest height, will soon do so. Nomenclators will then find that the violation of those wholesome rules, laid down by the fathers of science, will no longer be tolerated ; they will perceive that their own names are set aside with as little scruple as they have striven to cancel the names of their predecessors. The enormous multiplicity of synonyms, if not their inextricable confusion, will render a selection absolutely necessary ; and that selection will, of course, consist of the best. It will at length be discovered in this, as in all other things, that “ honesty is the best policy.” They will again fall back on the only safe and sure rule of proceeding, — the law of priority. Thus will hundreds of useless names be swept even from our synonyms, and the evil we have now complained of will finally work its own cure.

* In a recent “ New Arrangement ” of the Ruminating Animals, in one of our periodicals, this has been done to an extent hardly to be believed. These abortive attempts to obscure the high merits of Hamilton Smith, whose knowledge of this order far exceeds that of any living zoologist, is not very honourable to the state of science among us.

(173.) In the meantime we shall do our best to restore a just and impartial nomenclature; and in the following synopsis of the order we shall only notice those divisions which appear to us to claim a permanent consideration. There are, doubtless, many others among such as we have not adopted, which may eventually prove to be of the same character. But we think it more preferable to err on the safe side than on the contrary. Had we possessed the same facilities for determining the types of form among the reptiles as among the fish, the following arrangement would have been much more complete. We trust, however, that two eminent herpetologists of this country, both of whom are not only well acquainted with our theory of natural classification, but are familiar with all the details of this branch, will take up the subject; improving and completing what we must consider, in the minor divisions, as but a rude sketch of the circular series of the class before us.

ORDER I. EMYDOSAURES, Blainville. *Crocodiles.*

Body lizard-shaped, loricated with square bony plates or shields, which are generally carinated, and form two elevated crests on the tail; sides of the body with small scales; feet palmated; head very large and depressed; mouth enormous.

CROCODILUS. *Crocodile.* Anterior toes four, posterior five, but only three claws upon each foot; tail compressed, carinated, and serrated; muzzle oblong, depressed; inferior canines received into a notch at the edge of the upper.

C. vulgaris. Cuv. Ann. Mus. x. pl. 1. fig. 5.

CHAMPSA Wagler. *Alligator.* Muzzle elongated; teeth unequal, the lower canines received into corresponding pits in the upper jaw; feet pectinated.

C. palpebrosus. Spix, pl. 1. Mississipensis. Catesby, ii. pl. 63.

STENOSAURUS Geoff.* *Gavial*. Jaws very long, cylindrical, and exceedingly narrow ; teeth small, nearly equal.

S. Gangeticus. Shaw, Zool. iii. pl. 60.

ORDER II. CHELONIDES. *Tortoises and Turtles*.

Body oval, thick, enveloped in two large shields or bucklers, which are only open where the head, tail, and limbs are inserted.

FAMILY 1. TESTUDINIDÆ. *Land Tortoises*.

Feet club-shaped, very obtuse ; toes remarkably short, and very closely united to each other as far as the claws ; the anterior feet with five, the hinder with four, thick and conical claws ; the carapace, or upper shield, solid, hemispherical, and covered with horny plates ; the hinder marginal plate broad and incurved ; tail thick and short : herbivorous.

TESTUDO. Feet with five toes, the posterior with only four claws ; carapace of a single piece ; the sternum, or under plate, not moveable.

Testudo Linn. Sternum in all its parts immoveable, and of eleven or twelve plates.

T. Græca Linn., Auct.

Chersina Merrem, Gray. Sternum moveable behind.

T. marginata. Zool. Morée, pl. 2. fig. 2.

Hæmopus Dumeril and Bibron. Sternum and carapace of a single piece ; four toes and claws upon each foot.

H. areolatus. Encyc. Méth. pl. 6. fig. 3.

Pyxis Bell. Each foot with five toes, but the posterior with only four claws ; carapace of a single solid piece ; anterior part of the sternum moveable.

P. arachnoides Bell. Lin. Tr. xv. pl. 16. Erpetol. 14. 1.

Cinixys Bell. Resembling the last ; posterior of the carapace moveable.

C. Homeana Bell. Linn. Tr. xv. pl. 17. fig. 2.

* Including the genera *Telcosaurus* and the gavial crocodiles of the same author.

FAMILY 2. EMYDÆ. *River or Emys Turtles.*

Feet palmated, the toes distinctly separated ; claws long, acuminate, five upon the anterior and four upon the hinder feet ; nostrils pervious ; jaws horny ; body depressed, covered with corneous plates, those on the sternum eleven or twelve.

Cistuda Gray. **BOX TERRAPINS.** Sternum very wide, the extremities rounded, divided across by a cartilaginous suture, and only connected to the carapace, or dorsal shell, in the same way ; the two divisions of the sternum are thus moveable on the same axis, and can be closed so as entirely to conceal the enclosed animal.

C. Europæa. Sch. Fish. pl. 1. Gray, Synop. pl. 19.

EMYS *Brong., Gray.* Sternum dilated, large, and solid ; anterior portion truncated, posterior bifid ; the symphysis broad, bony, and covered with six pair of hard shields.

spinosa. Ind. Zool. ii. Sprengleri. Shaw, Zool. iii. 1. pl. 9.

KINOSTERNON *Spix.* Sternum rather wide, rounded in front, and sometimes slightly bilobed behind, and composed of eleven plates only ; the front and hinder lobes articulated on the central lobe ; symphysis narrow ; inguinal plates long, but very narrow.

K. Pensylvanicum. Gray, Syn. 6. f. 4. odoratum. Ib. f. 1. p. 36.

Sternotherus Bell. Sternum wide, with the front, and sometimes the hinder lobes moveable ; jaws horny.

C. castaneus. Bell, Zool. Journ. ii. pl. 14.

Chelodina Fitz. Sternum remarkably broad ; shell much depressed ; neck very long.

C. longicollis Gray. Shaw, Zool. of N. Holl. pl. 7.

Hydraspis Bell. Sternum narrow, solid, much resembling that of Kinosternon, but the symphysis is broader ; the intergular plate small and marginal ; head broad, depressed, and covered with one or more large plates ; nostrils short and tubular ; neck large and warty ; chin with two beards.

H. sub-rufa. Lac. pl. 12.

FAMILY 3. TRIONYCIDÆ, Gray. *Soft Tortoises.*

Feet palmated ; three claws only upon each foot ; the carapace, or shell, covered with a soft skin, which is expanded round the eye, so as to form a fin-like margin ; sternum very small, thin, and in parts flexible.

TRIONYX *Geoff.* Margin of the shields cartilaginous, and the sternum narrow.

T. ferox Merr. Shaw, Zool. iii. 1. pl. 17.

Emyda Gray. Margin of the shield with a series of small bones in front and behind ; the limbs covered, when withdrawn into the shell, by the flaps or valves attached to the sternum.

FAMILY 4. CHELONIDÆ, Gray. *Turtles, or Sea-Tortoises.*

Feet in the form of compressed fins ; shell surrounded with a bony margin ; claws variable.

CHELONIA *Gray.* Shell covered with horny scales, either depressed or imbricate.

C. imbricata. Shaw, Zool. iii. 1. pl. 27.

SPHARGIS *Merr.* Shell covered with a coriaceous skin.

S. coriacea. Shaw, Zool. iii. 1. pl. 21.

FAMILY 5. CHELYDRIDÆ, Sw. *Long-tailed or Crocodile Tortoises.*

Tail very long, sometimes armed with carinated scales ; feet palmated ; sternum unusually small, cruciform ; the symphysis narrow.

CHELYS *Dumeril.* Tail only moderately long ; nostrils lengthened, tubular ; snout very broad, depressed ; lips soft ; eyes minute ; head and neck with membranaceous appendages ; the latter thick, flat, and long ; sternum narrow, rounded in front, and acute behind.*

C. fimbriata. Shaw, Zool. iii. 1. pl. 8.

* The form of the head and nostrils seems to connect this with the

PLATYSTERNON *Gray*. Sternum small, bifid behind, solid ; head very large, not retractile within the shell ; feet with five anterior, and four posterior claws ; tail very long, equal to the length of the body, scaly, but not crested.

P. megacephalus. Gray, Ind. Zool. ii. pl. 62.

CHELYDRA *Schweigg.** Sternum remarkably narrow, and cruciform ; the plates membranaceous, and more resembling skin than bone ; symphysis very narrow ; feet large and robust ; tail very long, with crested longitudinal plates, like those of the alligators.

C. serpentina. Shaw, Gen. Zool. iii. 1. pl. 29.

ORDER III. ELANOSAURES, Conybeare. *Fish* *Lizards*.

Lacertiform ; feet in the form of fins, as in the aquatic turtles ; tail short, compressed ; the articulating surfaces of the vertebræ concave ; eyes very large, nocturnal.

ICHTHYOSAURUS *Kœnig*. Head large, lengthened ; neck short ; teeth none ; jaw received into a pit at the bottom of those in the other jaw.

I. communis *Cuv*.

PLESIOSAURUS *Conybeare*. Head small ; neck excessively long, and composed of numerous vertebræ.

P. dolichodeirus. Cony. Geol. Trans. i. pl. 48.

SAUROCEPHALUS *Harlan*. Teeth like incisors, placed in pits, with a regular hole on the inner edge of the alveola.

S. lanciformis. Am. Trans. v. pl. 16.

ORDER IV. OPHIDES. *Serpents*.

Body covered with scales, and either entirely without

Trionycidæ, but it remains to be determined if any, and what, other of the sub-genera, composing Mr. Gray's genus *Chelys* (Griff. Cuv. p. 14.), really belong to this group, or form part of the *Emydæ*.

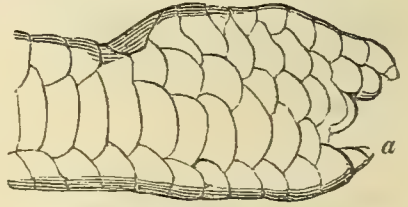
* We regret that the inviolable law of priority, without which our nomenclature would be daily changing, obliges us to retain this name instead of the peculiarly expressive one of *Emysaurus*.

limbs, or with those members in an almost rudimentary state ; the belly protected by large transverse plates.

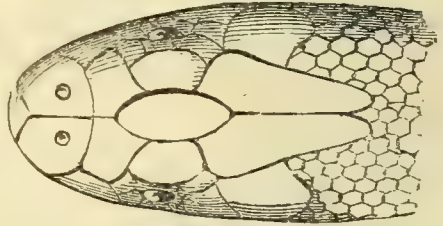
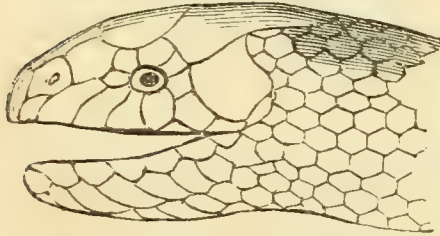
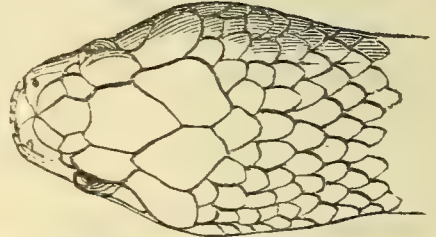
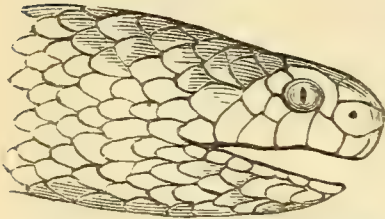
FAMILY 1. HYDROPHIDÆ, Sw. *Water Snakes.*

Body and tail (*fig. 112 a.*) much compressed ; nostrils vertical, operculated ; ventral plates narrow, formed of two united scales ; anal spurs none.

HYDRUS Shaw (*fig. 112.*) Head small, and not enlarged behind ; the snout obtuse, and the upper part covered with large plates ; body covered with scales ; belly with two rows of larger scales.



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nigricinctus. Russ. Serp. pl. 6. *chloris.* Ib. pl. 7.

PELAMIS Daud. Head gibbous, or enlarged behind ; all the scales small, equal, and hexagonal ; head with large plates ; poisonous.

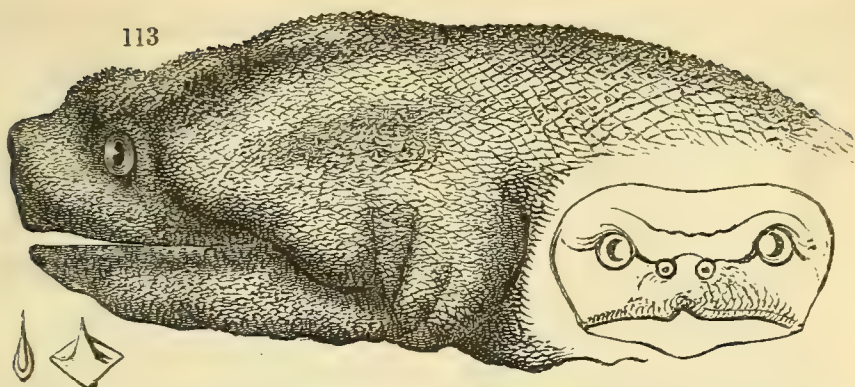
P. bicolor Schn. Russ. Serp. pl. 41.

CHERSYDRUS Cuv. Head and body entirely covered with small carinated scales ; the tail compressed.

C. granulatus Mer.

ACHROCORDUS Cuv. Resembling the last, but the tail is not compressed.

A. Javanicus Auct. *dubius (fig. 113.)*



HERPETON *Daud.* Head furnished with two soft scaly tentacula; the crown covered with plates; those on the belly narrow; tail long.

H. tentaculatus Daud.

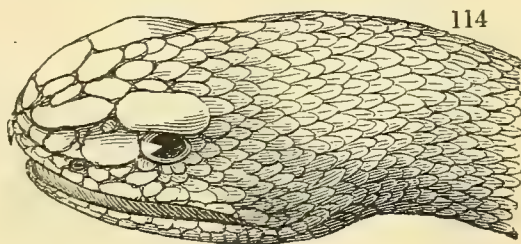
PSEUDOBQA *Oppel.* Head short, enlarged behind, and covered with large plates; back carinated, with a longitudinal range of scales, wider than those of the sides.

P. fasciata Schn. Russ. pl. 3.

FAMILY 2. CROTALIDÆ. *Poisonous Snakes.*

Terrestrial; upper jaw without teeth, but furnished with two large moveable poisonous fangs; tail short, conical, and cylindrical.

CROTALUS. *Rattle-snakes.* Scales on the head similar to those on the back; tail terminating in a rattle; head triangular.



C. horridus Linn. Catesby, ii. pl. 41. (fig. 114.)

Caudisona Fitz. Resembles the last, but the head is covered with plates.

C. miliaris. Catesby, ii. pl. 42.

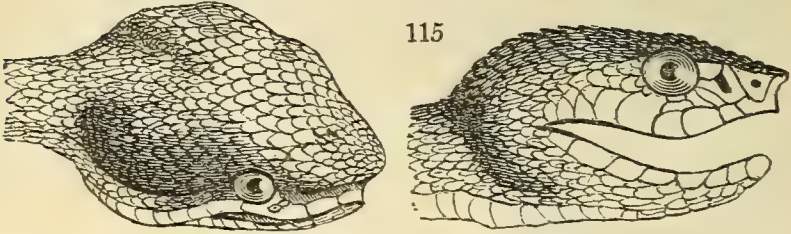
TISIPHONE *Fitz.* Tail terminating in a spine or sting; head covered with plates, as far as behind the eyes.

T. Shawii Gray. Catesby, ii. pl. 45.

Craspedocephalus Fitz. Head covered with scales ; sub-caudal plates double.

C. rhombeata Max.

COPHIAS Merrem. Tail simple ; head large, broad behind, sub-triangular, covered only with scales ; sub-caudal plates double. (*fig. 115*).



115

C. lanceolatus. Lac. ii. pl. 5. f. 1.

Trigonocephalus Ope-
pel. Differs from
the last in having
plates upon the
head. (*fig. 116*.)

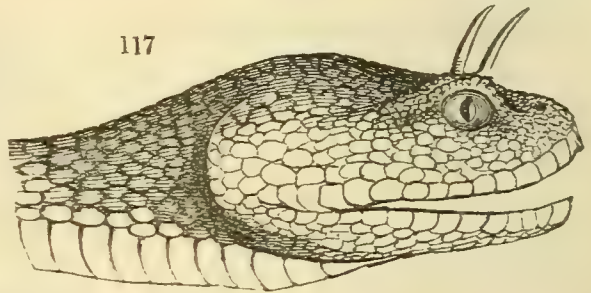
T. orophyas Opp.

CERASTES Antiq.

Head broad, covered with scales or small shields ; no depressions behind the nostrils.

Cerastes, proper.

Head covered with scales similar to those on the back ; nostrils large, simple ; sub-caudal plates double.



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S. horridus. Sw. Shaw, Zool. pl. 103. (*fig. 117*.)

Berus. Head covered with granular scales ; nostrils moderate ; sub-caudal plates double.

B. vulgaris. (*Coluber berus* Linn.)

Echis Merr. Scales of the head small ; sub-caudal plates single.

E. bizonata. Daud. pl. 70.

Acanthopis. Tail terminated by a hook ; scales in front of the head ; sub-caudal plates simple and double.

A. cerastinus. Daud. v. pl. 77.

NAIA. *Hooded Snakes*. Head moderate, without any depression, and covered with large regular plates.

Naia Daud. Neck capable of being dilated ; head narrow ; dorsal scales linear ; tail conical ; sub-caudal plates arranged in two rows.

tricuspidans. Daud. 4. pl. 60.

Sepidon Merr. Neck not capable of being dilated ; head broad ; sub-caudal plates double.

S. porphyraceus. Shaw, Zool. iii. 423.

Elaps. Head narrow ; dorsal scales equal ; tail conical ; sub-caudal plates double.

furcatus. Russ. ii. pl. 19.

PLATURUS *Lat*. Head indistinct ; body cylindrical ; dorsal scales equal ; tail compressed, carinated ; sub-caudal plates double.

P. laticaudatus. Shaw, Zool. ii. 233.

Trimesurus *Lat*. Head distinct ; body fusiform ; tail conical ; caudal plates partly single, partly double.

T. leptcephalus. Lac. Ann. Mus. iv. pl. 56. f. 1.

Oplocephalus *Cuv*. Like the last, but the caudal plates all simple.

O. Cuvieri *Gray*.

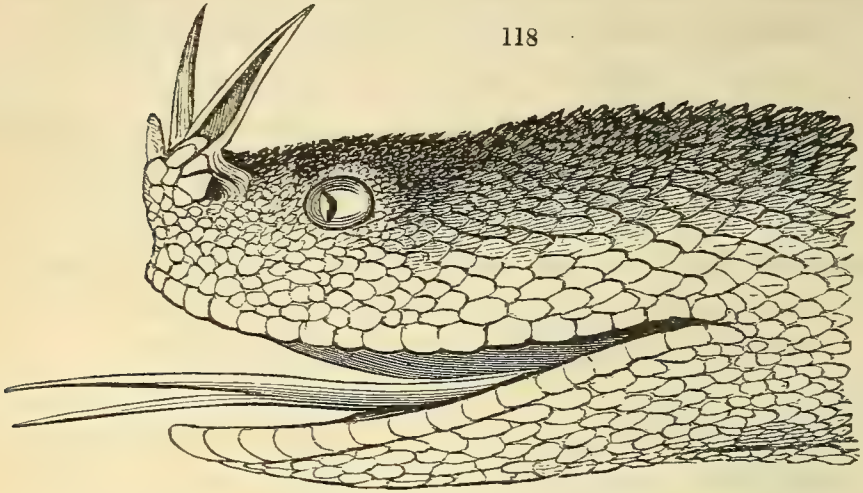
FAMILY 3. COLUBERIDÆ.

Lower jaw mobile ; upper jaw toothed ; fangs either entirely wanting, or very small.*

COLUBER. Ventral plates broad ; anal spurs none ; tail in general much lengthened, attenuated, and simple.

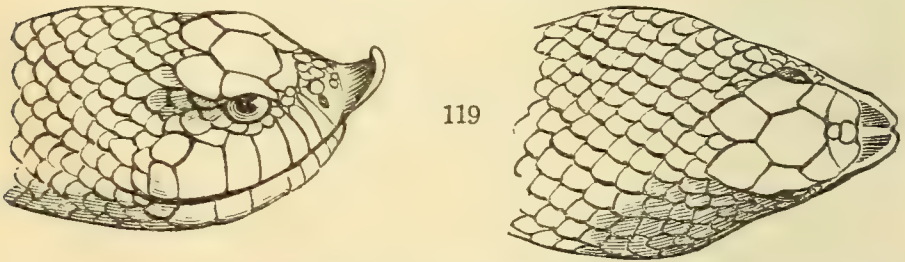
* In a natural arrangement of this order, I am inclined to believe that the whole of the poisonous or fanged snakes will be transferred to the last family.

Coluber Linn. (*g.* 118.) Body sub-cylindrical ; scales equal ; nose rounded ; head moderate, with plates on the crown, those beneath the tail either single or double.



C. natrix Linn. *Nasicornis.* (*fig.* 118.)

Heterodon. (*fig.* 119.) General structure of the last, but the nose is acute and recurved.



H. platyrhinchus Lat. *Constrictor.* (*fig.* 119.)

SPILETES Wag. Tail half the length of the body ; scales placed in longitudinal series, generally smooth ; abdominal plates recurved and angulated ; head distinct ; mouth very small.

S. punctatus. (*Coluber punctatus* Linn.)

XENODON Boie. Tail short, not half the length of the body, which is thick and fusiform ; head large, distinct, depressed ; mouth very wide ; nostrils large, open ; scales equal, placed in oblique transverse series. *severus.* Seba, i. pl. 85. fig. 1.

Oligodon Boie. Tail short ; heads short, obtuse, narrow.
atriventus. Seba, ii. pl. 86. fig. 5.

ERPETODRYAS. Tail very long ; head lengthened, and very distinct ; mouth very wide ; scales small, partly carinated, and placed in oblique series.

carinatus. Seba, ii. pl. 56. fig. 3.

HURRIA Daud. Tail conical ; anterior sub-caudal plates simple, posterior double ; dorsal scales uniform.
nympha. Russ. pl. 36, 37.

LIOPHIS Wag. Head scarcely distinct from the body ; scales imbricate, very smooth ; mouth small or moderate ; hinder teeth largest.

L. poicelogyrus Max. Griff. Cuv.

Calamaria Boie. Body cylindrical, confounded with the head ; tail very short ; scales smooth ; caudal plates entire, in two rows.

C. Linnæ Boie. (Coluber calamarius Linn.)

Brachyorrhos Kuhl. Head not distinct ; eyes small ; tail short, acute.

albus. Linn. Mus. Adol. pl. 14. fig. 2.

Lycodon Boie. Scales nearly square ; body long, sub-compressed ; abdominal plates convex.

L. fasciolatus Linn. Shaw, Russell, Serp. i. pl. 21.

Zenopeltis Boie. Nose rounded ; plates of the head triangular, larger than the dorsal scales ; tail conical.

Z. concolor Boie.

Scytale Merr. Head ovate, indistinct, plated ; body cylindrical ; scales equal ; sub-caudal plates single.

S. coronata. Seba, ii. pl. 41. fig. 1.

Dryinus Merr. Head long, with regular plates ; muzzle acute ; scales slender, equal ; tail very long ; sub-caudal plates double.

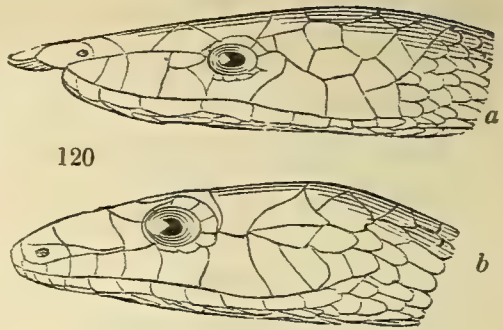
D. fulgidus. Daud. pl. 80.

Passerita Wag. (fig. 120. a.) Like the last, but the dorsal scales are triangular, and the lateral scales linear.

P. nasutus. Russ. Serp. i. pl. 12.

Leptophis Wag. (b). Like *Dryinus*, but the snout is rounded and obtuse, with the ventral plates angularly carinated on the sides.

L. ahætula. Lac. ii. pl. 2.



AMBLICEPHALUS Kuhl. Head very high, truncate, depressed above, plated before ; body compressed, with longer vertebral scales ; lateral scales imbricate.

A. carinata Boie.

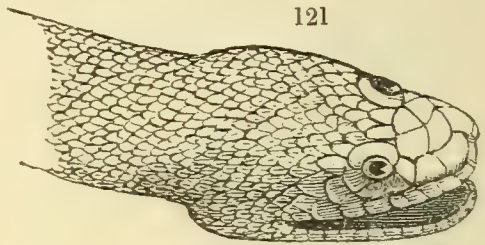
DIPSAS Laur. Head short and broad ; crown plated ; body long, compressed ; vertebral scales square ; lateral scales linear ; sub-caudal plates double.

bucephalus. Seba, i. pl. 43.

Cerebus Cuv. (fig. 121.)

Head almost entirely covered with small scales, but there are plates between and in front of the eyes.

C. rhynchops. Russ. Serp. pl. 17.

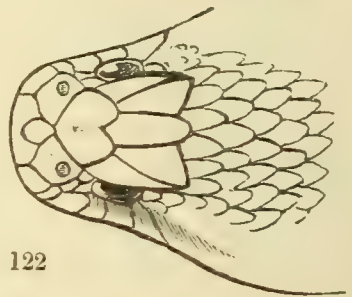


Boa Linn. Two curved spurs or hooks on the sides of the vent ; body thick in the middle, the extremities narrowed ; tail prehensile ; sub-caudal plates simple : Tropical America.

Boa Linn. Muzzle covered with scales ; labial scales variable.

B. constrictor, Seba, i. pl. 36. fig. 5.

Aculeata (fig. 122.)



Eunectus Wag. Muzzle covered with plates instead of scales.

E. murina. Seba, ii. pl. 23. fig. 1.

PYTHON. General characters of Boa, but the head is more or less covered with small plates in front : Tropical India.

Cenchrus Gray. Head obliquely cut behind ; front truncate and covered with small plates, those beneath the tail simple.

C. regia. (Boa regia *Auct.*)

Python Daud. Characters as above ; but with the sub-caudal plates double.

reticulata Sch.

Peronii Cuv.

Javanicus. Seba, pl. 62.

punctatus Merr.

Gongylophis Wag. Scales of the head and back similar and carinated.

B. ornata Daud. Russ. Serp. pl. 4.

Erix Daud. Tail very short and obtuse ; head short, not distinct from the body, and covered only with small scales ; anal spines wanting.

FAMILY 4. ANGUIDÆ. *Slow-worms.*

The entire head and body covered with smooth imbricate scales ; head osseous ; bones of the shoulder and of the pelvis generally existing in a rudimentary state under the skin.

PSEUDOPUS *Merr.* A prominent tubercle on each side of the anus, in which is a small bone analogous to the femur, and representing the hind legs ; scales square, thick, and semi-imbricate.

P. Pallasii Cuv.

OPHISAURUS *Daud.* Resembling the last, but with no external representations of the hind legs ; a ridge, as in the last, shows the situation of the fore feet of Seps.

O. ventralis. Catesby, ii. pl. 59.

ANGUIS *Linn.* Body entirely smooth, and surrounded with imbricate scales ; tympanum concealed beneath the skin, as also the rudiments of the pelvis, sternum, clavicle, and omoplate.

Acontias Cuv. No rudiments of feet internally or externally; tail short; head masked; eyes very small, sometimes covered.

A. meleagris Merr.

cæcus Cuv.

FAMILY 5. AMPHISBÆNIDÆ. *Blind-worms*.*

Body cylindrical, surrounded with scales arranged in circles; eyes either very minute or entirely concealed; anus almost at the end of the body.

AMPHISBÆNA Linn. Scales quadrangular; a range of pores in front of the anus; a few conic teeth in the jaws only; generation oviparous.

A. alba. Lac. ii. pl. 21. fig. 1.

Leposternon Spix. General structure of the last; head short; the muzzle slightly advanced; thoracic rings irregular.

L. microcephalus Spix.

TYPHLOPS Sch. Eyes hardly visible; anus close to the extremity of the body, which is sub-cylindrical, and covered with small imbricate scales; front of the head with plates; muzzle produced.

Stenostoma Spix. Muzzle depressed, obtuse, and covered in front with several plates.

S. reticulata. Spix.

Typhlops. Muzzle with a single frontal sharp-edged plate.

T. lumbricalis. Seba, pl. 86. fig. 2.

Rhinophis Wag. Muzzle pointed, conical; tip of the tail enveloped in an oval horny shield; eyes hid.

R. Philippinus Cuv.

Typhlina Wag. Muzzle with a single convex plate; eyes none; tail ending in a spine.

T. septemstriatus Merr.

ANILIUS. *Coral Snakes*. Body and head cylindrical,

* If these form part of the *Anguidæ*, and are not the most aberrant family, then I am unacquainted with the latter.

with small imbricate scales, which are but slightly larger on the belly, and under the tail; the latter extremely short.* (Tortrix † *Oppel*.)

Anilius Oken. Tail obtuse; a single series of larger scales beneath.

A. corallinus. Seba, ii. pl. 73. fig. 1—3.

Urapeltis Cuv. Head very small; muzzle pointed; tail obliquely truncated, with a double range of scales.

U. Ceylonicus Cuv.

ORDER V. SAURES. *Lizards*.

Feet four ‡; mouth not capable of dilatation; body covered with different-sized scales or granulations.

FAMILY 1. CHAMÆLIONIDÆ. *Chamelions*.

Feet scansorial; toes syndactyle, two before and three behind; tongue vermiform, capable of great extension; tail prehensile. The scansorial type.

CHAMELION *Linn*. Scales granular; a series of spines on the chin and belly; body compressed, carinated, but without dorsal spines; eyes versatile; occiput elevated, pyramidical; front smooth.

C. carinatus. Shaw, Zool.

TRIOCEROS *Sw*. General structure of Chamelion; but there are three long conical slightly curved horns, pointing forwards, before the eyes.

T. Grayii *Sw*. Gray's Zool. Miss. pl. 4. p. 7.

Diceros *Sw*. General structure of the last, but with

* It remains to be determined whether this group enters among the *Coleluberidæ*, connecting them with the *Anguidæ*, or forms a portion of the latter family. In placing them among the former, I have adopted the views of Cuvier. To the *Ambisbænæ*, they seem related by analogy.

† This name must be rejected, being long established in entomology.

‡ Becoming rudimentary, or partly obliterated, in the family of *Scincoidæ*, which connects the lizards to the serpents.

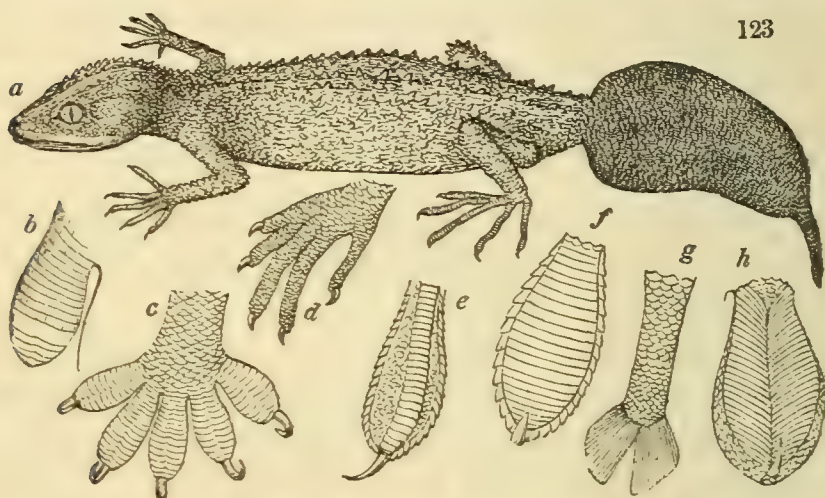
the front of the male produced into two compressed squamose horns.

D. bifurcatus. Griff. Cuv. ix. pl. 29.

FAMILY 2. IGUANIDÆ. *Spine-backed or Thick-tongued Lizards.*

Toes free ; palate furnished with teeth ; tongue fleshy, thick, not extensible, and only emarginate or notched at the tip.

PLATYDACTYLUS. *Geckos, or Flat-toed Lizards.* Tongue large, flat, and almost entire at its tip ; head and body broad, much depressed ; toes nearly equal, generally dilated on their sides, and marked beneath with transverse folds : the natatorial type.



a. *Phyllurus australis*, Sw.

b. *Platydactylus inunguis*.

c. *Hemid. trihedrans*.

d. *Stenodactyl. guttatus*.

e. *Hemidactylus tuberculosus*, upper side.

f. *Hemidactylus tuberculosus*, under side.

g. *Ptyodactylus lobatus*.

h. *Platydactylus theconyx*. Dum.

Platydactylus Cuv. (fig. 123. b.) Toes more or less enlarged along their whole length ; the inferior laminæ imbricated, entire, or divided in the middle.

P. ocellatus Cuv. *theconyx*. Dum. Erpet. Gen. pl. 33. fig. 2.

Hemidactylus Cuv. (c. e. f.) Basal joint of four or five

of the toes on each foot forming an oval disk ; the next, or second joint, slender ; five claws on each foot ; beneath the tail with a series of broad scales.

H. Peronii. Erpet. Gen. pl. 30. Sebæ. Shaw, Gen. Zool.
fig. 1. iii. pl. 78. fig. 1.

Ptyodactylus Cuv. (*g.*) The extremities of the toes only dilated into a disk, which is either smooth or striated, with imbricate laminae, like a fan ; the disk cleft in the middle ; claws five on each foot, and much curved.

lobatus Rüpp. Atl. i. pl. 4. porphyreus. Erpet. G. pl. 33. 3.

Sphæriodactylus Cuv. Toes sub-cylindrical, without claws, but terminating in a small, entire, circular disk.

S. sputator. Lac. pl. 28. fig. 1, 2.

Phytodactylus Gray. The extremities of the toes dilated into a disk, which is flat and smooth beneath, but divided in the middle by a groove.

P. porphyreus. Erpet. Gen. pl. 33. fig. 5.

ANOLIS. Head and body generally compressed ; gular pouch very large, and capable of great dilatation ; antepenultimate joint of the toes enlarged into an oval disk* ; tail generally round, moderate, but never flattened or prehensile.

Stenodactylus Cuv. (*d.*) General structure of *Platydictylus*, but the toes are all simple, without any disk ; the tail round, and generally covered with imbricate scales.

marmoratus Sw. Erp. G. pl. 34. 1. flavipunctatus. Rüpp. ii pl.
pulchellus. Gray, Ind. Zool. 6. fig. 3.†

Timorensis. Erp. G. iii. 411. Dorbignii. Erp. Gen. 418.

Gandichandii. Ib. 413. fasciatus. Ib. 420.

Mauritanicus. Ib. 414. scaber. Rüpp. Atl. 4. 2.

albogularis Sw. Erp. G. 415.

* Except in the first division, *Stenodactylus*, which connects *Anolis* with *Platydictylus*, just as *Phyllurus* effects the same union with *Stellio*.

† The compressed tail of this species opens a passage to *Dactyloa* ; the head is also flattened.

Anolis Dum. Tail simple, rounded, or slightly compressed; head short, not depressed.

A. bullaris. Cuv. Catesby, Card. ii. pl. 66.

Xiphosurus Fitz. An elevated crest on the tail, supported by the spinous processes of the vertebræ; the declap very large, and extending to the belly.

X. Cuvieri Fitz. Règ. Anim. pl. 5. fig. 1.

Cristatellus. Ib. iii. p. 143. (*Anolis velifer.* Erp. G. iii. p. 164.)

Dactyloa Wieg. Head greatly elongated and flattened, triangular; nostrils vertical, considerably removed from the tip of the snout; tail nearly round; the crest obsolete.

D. Carolinensis Sw. Catesby, Car. pl. 26.

POLYCHRUS Cuv. Toes slender, free, without any dilated disk; tail long, slender, smooth, more or less prehensile; palate sometimes destitute of teeth; body smooth or not crested; throat pouched.

Norops Wag. General structure of *Anolis*, but the toes have no disk, and the gular pouch is but small; palate without teeth, and no pores on the thighs; tail long, but not prehensile; scales carinated, but without a dorsal crest.

A. auratus. Daud. iv. 89.

Urostrophus Dum. and Bib. Tail long, curled, and prehensile; teeth in the palate; femoral pores none.

U. Vanturi. Erpet. Gen. iv. 79.

Læmanotus Wieg. Tail not prehensile; a transverse fold or ridge under the neck; no femoral pores: *L. longipes.* Weig. Mex. pl. 4. *acutirostris.* Spix, pl. 14. *a.*

Polychrus Cuv. The fourth toe on each foot not longer than the third; gular pouch small; tail not obviously prehensile.

marmoratus. Seba, pl. 76. 4. *anomalus.* Erp. G. iv. 69.

Brachylophus Cuv. Gular pouch small ; general characters of Iguana ; but the tail is very long and slender, almost entirely rounded, and covered with small equal imbricate scales* ; back with a low spinal crest ; palate toothed : 3 sp.

fasciatus Cuv. Erp. Gen. iv. 226. *rhombifer*. Spix, pl. 11.

IGUANA. Toes free, unequal, and simple, without appendages ; palate furnished with two ranges of teeth, and a single row of compressed triangular teeth with indented edges in each jaw ; body and tail more or less compressed, covered with small imbricate scales.†

Ophryæssa Boie. General form of *Brachylophus* and Iguana, but the back and tail is strongly crested.

O. superciliosa. Spix, pl. 10.

Iguana Laur. Gular pouch very large ; dorsal and caudal crest spinous ; tail long, compressed ; palate with two rows of teeth ; caudal scales equal, imbricate, and carinated.

I. tuberculata Laur. Seba, i. pl. 95. fig. 1.

Basiliscus Laurenti. Occiput prolonged into a large, obtuse, cap-like crest ; dorsal and caudal crests, in the males, very large, and with bony excrescences ; toes long, the sides fringed ; tail sometimes not crested.

B. mitratus. Seba, i. pl. 101. 1. *cristatus*. Seba, i. pl. 94. 1.

Amblyrhynchus Bell. Toes thick, short, and nearly equal ; throat loose, but without a gular pouch ; a dorsal crest on the back and tail.

A. cristatus Bell. Zool. Journ. 204. pl. 12.

Aloponotus Dum., Bibron. The upper part of the body destitute of scales, but the back and tail cari-

* This character, but for the palatine teeth, would place this sub-genus among the *Agamidæ* ; at present, I consider it the passage between *Polychrus* and *Iguana*.

† The teeth in the palate separate these lizards from the *Agamidæ*, but both groups require a more perfect analysis than they have yet received, especially in reference to the sub-genera.

nated with a low crest of pointed spines ; tail compressed ; the scales verticillated, and carinated, femoral pores in two ranges ; palate with two rows of teeth.

A. Ricordii. Erp. Gen. iv. 190. pl. 37.

STELLIO. Toes free, unequal, simple, without appendages ; palatine teeth wanting ; tail in general long, thick, and surrounded by rings of large and often spinous scales ; body slender.

Cyclura Cuv. General form of Iguana ; gular pouch small ; neck and back with a crest of strong spines ; tail thick, covered with verticillated scales, alternating with rings of spines ; scales, palatine teeth, and femoral pores as in Iguana.

C. Harlanii. Amer. Trans. iv. pl. 15.

Stellio Daud. Head heart-shaped, greatly compressed, and enlarged behind ; no gular pouch ; the third and fourth toes of the anterior feet equal ; femoral pores none ; tail very thick, nearly round, attenuated and pointed, encircled with verticillated spiny scales.

S. vulgaris. Rüpp. Atlas, i. pl. 2. cyanogaster. Ib. ii. pl. 5.

Uromastix Merram. Head small, triangular ; muzzle short, obtuse ; tail flattened, very large, and obtuse, surrounded with rings of spinous scales.

U. acanthinurus Bell. Zool. Hardwickiii. Gray, Ind. Journ. i. pl. 17. Zool.

Phyllurus Cuv. * (fig. 123. a.) Head, body, and eyes as in *Platydictylus* ; toes simple ; tail very broad, leaf-shaped, dilated at the base, pointed towards the tip, and armed with semi-verticillate spines.

P. Cuvierii Miliusii Erp. Gen. iii. 431. White's Voy. pl. 3. fig. 2.

FAMILY 3. LACERTIDÆ. *Long-tongued or True Lizards.*

Body long, slender, smooth, elegant, without spines on the head and back, and very rarely on the ridge of the

* This interesting form at once connects *Stellio* with the Gecko lizards.

tail ; toes free ; tongue lengthened, slender, deeply forked, and capable of great extension ; scales of the tail and belly placed in smooth transverse parallel bands ; tail, typically, very long, attenuated, and generally round.

HYDROSAURUS Sw. Scales separated from each other by annular series of minute tubercles, and imbedded in the skin ; ridge of the tail rounded or carinated ; size large : analogous to the Emidosauri, or crocodiles.

Hydrosaurus Wagler.* Tail compressed, with a carinated ridge ; habits aquatic ; the fourth hind toe long.

H. Niloticus. Wag. Seba, chlorostigmus Gray. Griff.
pl. 100. fig. 3. variegatus. White's Voy. 3. 1.
Indicus. pl. 85. Ib. 2, 3. Bellii Sw. Erpet. Gen. 35. 1.
bivittatus. Shaw, Z. pl. 66. albogularis. Daud. iii. pl. 32.
capensis Lac.

Empagusia Gray. Body thicker ; tail shorter, nearly round, with a dorsal keel ; feet short, strong ; the fourth hind toe not longer than the third.

E. flavescens. Ind. Zool. ocellata Gray. Rüpp. Atl.
albogularis. Daud. iii. pl. 32. i. pl. 6.

Odatria Gray. Tail lengthened, round, with rings of keeled sub-spinous scales, and without any dorsal keel ; toes rather strong and moderate : Australia.

O. punctata Gray. Ann. Nat. Hist. No. 5. p. 394.

Varanus Fitz. Tail round or cylindrical, without a dorsal ridge ; habits terrestrial ; feet moderate.

V. arenarius. Erp. Gen. iv. 471. Timoriensis. Ib. 473.

HELODERMA Weig. Scales of the body resembling tubercles, and not surrounded with smaller granules ; tail round ; all the toes of the posterior feet inserted in the same direction as the others.

H. horridum. Wag. fas. ii. pl. 18.

LACERTA Linn. General form long, slender, smooth ; tail long, rounded, without any dorsal crests † ; head small, covered on the crown with large shields ; throat scaly.

* Including *Polydædalus* of the same nomenclator.

† Except in *Dracæna*, which unites this group to that of *Hydrosaurus*.

Lacerta. Toes simple, without any fringe, the hinder ones very long; in general there is a collar of broad scales round the neck; palate with two rows of teeth; dorsal and caudal scales smooth, rarely carinated: the Old World.

<i>L. viridis</i> Linn.	<i>nigra</i> Wolf.
<i>longicauda</i> Rüpp.	<i>saxicola</i> Evers.
<i>Dugesii</i> Miles, Ed.	<i>quadrilineata</i> Gray.
<i>Lalandii</i> Ib.	
<i>velox</i> Pallas.	<i>No collar</i> .*
<i>ocellata</i> Daud.	<i>punctata</i> Gray.
<i>Senegalensis</i> Gray?	<i>Cuvieri</i> Ib.
<i>lævis</i> Gray.	<i>Hispanicus</i> Fitz.
<i>vivipera</i> Jacq.	

Ameiva Cuv. No collar round the neck; all the scales of the throat being small; molar teeth none; scales of the belly broader than long: the New World.

A. punctata. Spix, pl. 23. *undulata*. Seba, ii. pl. 88. 2.

Scapteira Fitz. Toes fringed on the external margin; the claws very long and acute: the Old World.

inequalis. Sav. Egyp. pl. 1. 10. *Knoxii*. Miles, Ed. pl. 6. 8.

Acranthus Wag. Only four toes on the hinder feet; tail round.

A. viridis Wag. (*Lacerta* Teyou Daud.)

Dracæna† Daud. Tail compressed, surmounted by a double serrated crest; throat with a collar of large shields.

Guinensis Daud.

Amazonicus. Spix, pl. 21.

ZONURUS (?). "Lizard-like; ears exposed; legs four; femoral pores distinct; head depressed, broad behind; supra-orbital plate expanded; tail depressed, with whorls of large square-keeled spinous scales; back with keeled sub-spinose, belly with smooth scales; five toes on each foot: Old World."—Gray.‡

Z. Novæ Guineæ. Schlegel, pl. 7. fig. 2.

* Aberrant species apparently leading to *Ameiva*.

† Is not this the same as the *Hydrosaurus* of Wagler?

‡ Mr. Gray's definition of this group makes me conclude it is to be the exact representation of *Stellio* among the thick-tongued lizards; but, as he brings within it several genera which do not agree with the above definition, I am fearful of inserting the minor divisions.

Cicigna Gray. Tail rather compressed ; the scales, as well as those of the back, unarmed ; scales of the belly smooth.

C. semiformis. G.

LEIOLEPES Cuv. Lizard-like ; tongue but slightly extensible ; the anterior portion scaly, and triangularly bifid ; the posterior half papillose, with the hinder angles prolonged, as in birds ; head with very small polygonal plates ; ears naked ; belly with smooth and imbricated scales ; tail excessively long, smooth, and round : connecting the Lacertidæ with the Iguanidæ.

L. guttatus Cuv. Erp. Gen. iv. 465.

FAMILY 4. AGAMIDÆ Sw. *Frog or Great-bellied Lizards.*

No palatine teeth ; body thick, depressed (typically), gibbous ; tail and belly always covered with small imbricated scales ; head large, often inflated, armed with long spines on the nape, ears, or neck ; throat often furnished with a dewlap, capable of inflation ; tongue short, thick ; toes simple, free, without any discoid enlargement.

PHRYNOSOMA. Tail flattened, short, or moderate ; head and body greatly depressed ; no palatine teeth or anal pores.

Phrynosoma Wiegman. Body nearly orbicular ; scales on the belly, limbs, and tail small and imbricate ; those on the upper surface rather larger, and interspersed with longitudinal rows of spines ; tail shorter than the body ; hind head with large spines.

P. Douglassii Bell. Linn.	orbiculare. Wagl. Icones. fas.
Tr. xvi. pl. 10.	ii. pl. 23.
bufonium Wieg.	

Tropidolepis Cuv. Head and body short, depressed, the former rounded in front ; scales imbricate, carinated above, and smooth beneath ; tail thick, mode-

rate, rounded, but depressed at the base ; no dorsal crests or anal pores.

T. undulatus Cuv. Erp. Gen. iv. p. 198.

Callisaurus De Blainv.* General structure of *Phrynosoma*, but the body is slender and lengthened, the neck narrowed, and the limbs particularly long and slender ; tail long and broad, depressed at the base, rounded and attenuated beyond ; body enlarged on each side by a development of the skin.

C. draconoïdes Bl. Nov. Ann. Mus. iv. pl. 24.

Phrynocephalus Kaup. Tail more or less depressed towards the base, and conic or round beyond, generally prehensile ; head nearly circular, and much flattened ; no external opening of the ears ; tongue entire, triangular ; body depressed, wide ; toes slender, and fringed on the sides ; scales very small : representing the chameleons.

P. caudivolvulus. Lepech. pl. 22. figs. 2, 3.

Megalochilus Eichwald. Tail greatly depressed along its whole length ; the margin of the toes strongly dentated ; sides of the head with a large ear-shaped membrane ; head flat, nearly circular : representing the genus *Draco*.

M. auritus. Daud. pl. 45. fig. 2.

AGAMA. Tail very long, slender, rounded, rarely depressed, covered with imbricate scales ; nape spined, but no crest or spines on the back or tail.

Agama Daud. Head depressed ; tympanum large, open ; neck, and frequently the ears, armed with different-sized spines ; tail very long, slender, without any crest, generally cylindrical ; tongue emarginate ; anal, but no femoral pores ; throat with a fold ; the third and fourth hind toes equal.

colonorum. Rüpp. ii. pl. 4. sinaita. Ib. i. pl. 3.

* This learned anatomist arranges this form near the dragons, and it is not at all unlikely that this may be its natural situation.

Trapalus Cuv., Rüppell. Head compressed on the sides ; ears nearly concealed ; throat forming a conic dependent pouch ; the fourth hind toe longer than the third ; eyebrows with a carinated ridge, but no spines on the neck, back, or tail.

T. agilis. Rüpp. Atlas, ii. pl. 6. fig. 1.

Grammatophora Kaup. Head triangular, flattened, the tip rather pointed ; tympanum large, exposed ; tail very long, slender, cylindrical ; no gular pouch ; the toes slender, the fourth longer than the third ; pores on the thighs ; scales small, carinated, often prickly : Australia : 4 species.

G. muricata. White's Voyage, pl. 38. fig. 1.

Ceratophorus Gray. Ear or tympanum concealed ; tail long, very slender ; snout forming a short fleshy horn, covered with scales ; the third and fourth toes equal.

C. Stodartii. Gray, Ind. Zool.

LOPHYURA Gray. Head, body, and tail surmounted with a spiny crest, more or less developed in the different sub-genera ; caudal scales always imbricate ; tail always long, carinated and greatly compressed : the scansorial type.

Physignathus Cuv. Head obtuse ; a crest of spines extending from the nape to the end of the tail, which is compressed and gradually attenuated ; hinder fourth toe much the longest, the sides of all the toes fringed ; thighs with femoral pores.

P. Le Sueurii. Erp. Gen. iv. *Cocincinus* Cuv. Ib. Règ. pl. 40. Anim. pl. 6. fig. 1.

Lophyura Gray. General characters of the last, but the third and fourth toes are of nearly equal length and the sides of all broadly fringed ; the basal half of the tail is furnished with a very elevated, broad, fin-like crest, carinated with small spines.

amboynensis Gray. Phil. Mag. ii. p. 54. Shaw, G. Z. iii. pl. 62.

Calotes Cuv. Limbs remarkably long and thin ; muzzle produced ; gular pouch obsolete ; no femoral

pores ; scales of the body oblique ; a crest of small spines (highest on the nape) extends along the back and tail ; hinder fourth toe very long ; tail very slender, attenuated ; scales small, pointed, sometimes directed forwards.*

C. gutturosa. Lesson, Atl. 1. 1. *versicolor*. Am. Tr. iv. 19.

Lophyrus Dum.† Gular pouch very large ; toes as in *Calotes* ; nape elevated into a very spinous crest covered with scales at the base ; ridge of the body and tail with a crest of spines more or less developed in the species ; femoral pores none.‡

L. dilophus. Erp. Gen. pl. 46. (typical.)

tigrinus. Ib. pl. 41. (aberrant) with the frontal crest of *Lyriocephalus*.

Lyriocephalus Merr. Head short ; an elevated ridge or crest on the eyebrows unites in front, in the shape of a lyre, and forms two horn-like projections behind ; ears concealed ; gular pouch small ; tail rather short, obtuse, much compressed ; eyelids covered with scales, as in the Chameleons, but the aperture rather larger ; back and tail serrated with small, conic, acute, compressed scales ; snout gibbous ; the fourth hind toe very long.

L. scutatus Gray. Griff. ix. p. 54. *Grayii*. Sw. Ind. Zool.

DRACO. With an enormous development of the gular skin, or expansive membranes on the sides of the body.§

Sitana Cuv. Four unequal toes only on the hinder feet ; gular pouch of the males enormous, extending to the middle of the belly.

S. Pondicerianus. Règ. Anim. pl. 6. fig. 2.

* I do not believe the *C. ophiomachus* belongs to this group.

† *Lophyrus* cannot be retained in this division of Zoology, as that name designates a remarkable genus of birds.

‡ I consider this group, by its large gular pouch, to connect this genus to *Sitana*, and the dragons ; and that *Lyriocephalus*, of all others among the *Agami*, shows the greatest resemblance to the chameleons ; although one or two forms are necessary to fill up this latter series, which thus completes the circle of the whole order.

§ Corresponding to the *Vespertilionidæ* among quadrupeds, and the *Pleognathes* among fishes.

Clamydosaurus Gray. An enormously dilated skin, covered with scales, forms a collar round the neck; tail very long.

C. Kingii Gray. Griff. Cuv. ix. pl. at p. 90.

Draco. Sides of the body with expansive membranes resembling wings; tail very long, slender; gular pouch large, pointed.

abbreviatus. Gray, Ind. Zool.

Dussumierii. Erp. iv. 456.

viridis Shaw, G. Z. pl. 24.

hæmatopogon Boie.

Timoriensis Kuhl.

lineatus Less. Il. Z. 38.

5-fasciatus Gray.

spilopterus Wieg.

TROPIDURUS Wiegman.* Palate furnished with teeth; head pyramidical, of four sides, but not depressed as in *Phrynosoma* and *Agama*.

Tropidurus Wieg. No crest on the back or tail; head slightly obtuse, and rather thicker than the neck; no gular pouch; tail very long, cylindrical, attenuated; scales equal, imbricate, and not forming a dorsal or caudal crest; toes long.

Chilensis. Lesson, Atl. pl. 1. f. 2.

nigromaculatus Wieg. Ib.

cyanogaster Sw. Erp. Gen.

281.

273.

Fitzingerii. Ib. 286.

pictus. Ib. 276.

signifer. Ib. 288.

tenuis. Ib. 279.

maculatus. Ib. 290.

Wiegmanii. Ib. 284.

pectinatus. Ib. 292.

Leiocephalus Gray.† Head pyramidical, short; body depressed; a low-pointed crest of short spines extends the whole length of the back and tail, the latter compressed on the sides; neck smooth, with irregular folds on the sides, and an oblique fold in front of the shoulders; borders of the tympanum toothed.

L. carinatus Gray. Griff.

microlophus Sw. Ib. iv.

ix. 42. Erp. Gen. p. 44.

264.

* I see no reason for changing this well-established name to *Proctotretus*.

† Mr. Gray's designation has the unquestionable right of priority over that of *Holotropus*. It would really seem as if erpetologists thought it best to call every species by their own name, and set aside those of their predecessors.

FAMILY 5. SCINCIDÆ.

Feet and toes very short, the latter simple and free ; limbs sometimes rudimentary, or one pair disappearing externally ; tongue slightly, or not at all retractile ; all the scales on the body and tail smooth, shining, equal, and imbricated ; no crests of spines or gular pouch.

SCINCUS Linn., Daud. Possessing four feet ; tongue short, contractile, bifid.

Scincus Linn. The five toes of each foot margined ; muzzle acute.

S. officinalis Linn.

Trachydosaurus Gray. Tail broad, depressed ; muzzle rounded ; scales hard, bony.

T. rugosa Gray.

*Tiliqua** Gray. Muzzle rounded ; scales thin ; tail rounded, conical ; no palatine teeth.

T. Whiteii Gr. White's Voy. pl. 90.

Gymnothalmus Merr. anterior feet with only four toes.
G. quadrilineatus.

SEPS Daud. Body very long, serpentiform ; scales as in the last ; feet very small, and wide asunder ; number of the toes variable.

Lygosoma Gray. Toes five on each foot ; body very long and slender ; feet small, wide apart ; the hinder toes unequal, generally long ; ears distinct.

L. capistrata. Geoff. Rep. Egypt. pl. 9. fig. 10.

Seps Daud., Gray. Either three or four toes upon all the feet ; the ears distinct.

Seps Peronii.

CHALCIDES Daud. General structure of *Seps*, but the scales, instead of being imbricate, are rectangular, and are disposed on the tail in transverse bands ; legs four,

* It appears that this is the true type of the group ; if so, it would be desirable for Mr. Gray to distinguish it by the sub-generic name of *Scincus*.

distinct, and divided ; but the number of toes vary in the species.

C. imbricatus. Spix, pl. 27. *flavescens* Gray. Lac. pl. 32.

OPHIODES* Wag. The feet, either two or four, are rudimentary, and generally undivided.

Monodactylus Merr. Feet four, oblong, scaly ; scales of the body and tail carinated, pointed, and verticillate.

M. anguinus (*Lacerta anguinus* Linn.)

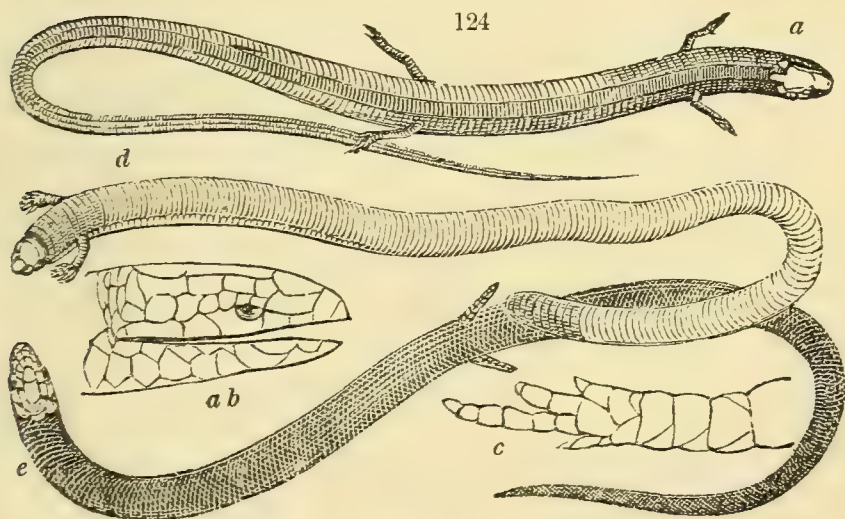
Ophiodes Wag. Feet two, undivided, the posterior pair obsolete ; scales uniform, imbricate ; tongue short, bifid.

Bipes Merr. (fig. 124. e.) Feet with two unequal toes.

B. anguinus Merr. Seba, i. pl. 85. f. 3.

CHIROTES Cuv. Two short fore-feet, divided into four toes ; scales verticillated ; head obtuse ; “ head, vertebræ, and skeleton resembling *Amphisbænæ*.” — (*Cuvier*.) Eyes very small ; tympanum covered.

C. canaliculatus Cuv. (fig. 124. a. b.)



a. b. a. *Chalcis tetradactyla*.
d. *Chirotus canaliculatus*.

e. *Bipes lepidopodus*.

* It remains uncertain whether this group is the last of the lizards, or the first of the serpents ; my impression is, that, by the relation pointed out by Cuvier, of *Chirotus* to *Amphisbænæ*, the latter arrangement will be the most natural. See Griff, Cuv. p. 163.

APPENDIX.

THE CHARACTERS AND DESCRIPTIONS OF SIXTY-TWO NEW OR
LITTLE KNOWN FISHES ALLUDED TO IN THIS WORK.

CLUPEA *auro-vittata*. Gold-banded Herring.

Above blue, beneath silvery ; body with a stripe of golden yellow on each side ; belly serrated ; ventral fin of nine rays, the two last rays very much branched.

Dorsal 18 ; ventral 9 ; anal 17 ; pectoral — ; caudal —.

Inhabits Sicily. Palermo, 1815.

General shape of ordinary herrings, *i. e.* oblong fusiform, being broadest in the middle, and narrowed towards the head and tail ; the dorsal profile as much curved as that of the belly ; dorsal fin nearer to the head than to the caudal ; it terminates exactly half-way between the tip of the snout and the fork, or central rays, of the caudal ; it is high in front, and low behind ; and its height is equal to its length, if the two last rays are not reckoned. The head is rather less than one fifth the length of the body, excluding the caudal fin. The centre of the fish, from the snout to the base of the caudal, is exactly marked by the eleventh dorsal ray. The ventral fin is very small, and is placed exactly under the dorsal, its commencement being on a perpendicular line with the ninth dorsal ray ; the anal is narrowed behind, and is not longer than the dorsal, if the last dorsal ray is not reckoned ; it commences just between the base of the caudal and the end of the dorsal : the pectoral, as usual, is pointed, and is just as long as the horizontal length of the dorsal. Total length about $10\frac{3}{4}$ inches ; greatest breadth $1\frac{3}{4}$ inch. Belly carinated and serrated ; gill membrane 6-rayed, the three lower ones broad and hard ; teeth none ; jaws equal, the upper not emarginate ; tongue thick and pointed, possessing, with the palate, a slight degree of roughness ; dorsal fin grooved ; scales large, close set, and firm ; pectoral fins with a scaly appendage at the base, and reposing in a depression of the body ; ventral fins also with an appendage nearly as long as the fin itself ; the two last rays are doubly forked, and resemble the finlets of the *Scomberidæ* ; the other rays are but slightly forked ; vent near the caudal fin ; this latter is deeply forked, and has at the base of the central rays two large oblong scales on each side ; lateral line imperceptible. COLOUR.—Back and upper parts rich dark blue, blending into an orange or golden coloured stripe near the back, which commences behind the operculum and extends to the base of the caudal ; the rest of the lower parts pure white ; dorsal and pectoral fins yellow, with dusky edges ; caudal olive yellow ; ventral and anals white. This fish is never met with in any quantity in the markets ; from which I infer that it is not gregarious, like most of its allies.

CLUPEA *Sicula*. Sicilian Sprat.

Ventral of eight rays, the last rather longer, with two

scaly appendages between them, but none to the pectorals ; caudal with two large scales in the middle ; belly serrated.

Dorsal 18 rays ; pectoral 17 ; ventral 8 ; anal 19.

Inhabits Sicily.

General length from 7 to 11 inches. In comparison with the common sprat, the body is more slender, the head longer, and the eyes proportionably more distant from the snout ; the dorsal fin is placed more forward, so that, in a specimen seven inches long, the exact centres between the tip of the snout and the end of the caudal is two tenths of an inch behind the dorsal fin, the height of which is precisely equal to its length ; the length of the head is exactly one-fifth of that between the tip of the snout and the fork of the caudal, and is precisely the same as the breadth of the body between the dorsal and anal fins ; the pectoral is shorter than the height of the dorsal, but as long as the anal, excluding the last ray of the latter ; the ventral is immediately under the centre of the dorsal ; jaws and palate perfectly smooth ; lower jaw rather longer than the upper ; scales large, deciduous ; two first rays of the dorsal fin short ; ventral with two scaly appendages between them ; pectoral reposing in a groove, but no appendage is mentioned in the original description, or expressed in the drawing ; ventral fin very narrow, with the last ray rather longer and thicker ; both this fin and the dorsal have the base slightly grooved ; caudal deeply forked, with two scaly appendages in the middle of the fork. COLOUR on the back dark blue, reflecting tints of rich ultramarine ; the sides of the head yellowish green, but those of the body silvery ; dorsal and caudal yellowish ; the rest white. The back is thick ; the belly sharp and distinctly serrated, as in the common sprat.

This is called by the Sicilians *Sardi*, a name they give to all the small herrings, and even to the anchovies ; it congregates and is captured in vast shoals on the coasts during the winter and early spring, when it is sold in baskets by weight, and is hawked about the streets of Palermo like our sprat is in London. In the year 1814-15, it was in the greatest profusion at Palermo from December to March.

But for the testimony of Cuvier, that the Sardine "is so similar to the pilchard, that no difference can be found except in its smaller size *," I should have imagined that this was the true *Clupea Sardini* ; but this cannot be, for the pilchard has the belly smooth, while that of our *C. Sicula* is as much serrated as in the common sprat. Lacepede makes the Sardine to be the same as the sprat ; but his description is too loose for determining either one or the other. Duhamel, whose work I have not seen, appears the only author who has figured the Sardine of Brittany, which is in all probability different from that of the Mediterranean.

CLUPEA *argentina*. Silver-striped Sprat.

Body with a broad silver stripe on each side ; belly serrated ; pectoral fin reaching to the base of the dorsal ;

* Griff. Cuv. x. p. 437.

ventral of eight rays, with four lengthened scales at their base ; dorsal nearest the head.

Dorsal 16 ; pectoral 16 ; ventral 8 ; anal 17 ; caudal 20.

Inhabits Pernambuco, Brazil, where it was common.
(January, 1817.)

The length of this species rather exceeds that of the full-grown of the common sprat, the average being from four to six inches, but it is a much broader fish, with the head larger in proportion and more obtuse ; the dorsal fin is placed much nearer the head, so that the last ray is exactly central between the tip of the snout and the fork of the caudal ; its height is also rather more than its length ; the ventral has its commencement rather behind the centre of the dorsal, and the latter fin and the anal are exactly of the same length ; the pectoral is rather lengthened, so that it reaches as far as to come immediately under the commencement of the dorsal ; caudal, as usual, deeply forked ; *belly* protuberant, sharp, and serrated ; body semitransparent ; jaws and palate rough ; tongue rather long, narrow, cylindrical, incurved, rough behind ; vent near the tail ; nostrils single, oval, near the tip of the snout ; gill membrane 6-rayed ; pectoral fin with lengthened scales both above and below the base, and similar scales are at the base of the ventral fins ; anal and dorsal fins with the last rays slightly lengthened. COLOUR.—Above pale blue ; the sides silvered ; along the middle of the body a bright band of silver (similar to that of the *Argentina*) from the gill-covers to the caudal fin ; fins pale, dusky, a blackish line at the base of the caudal ; the transparency of the body is sufficient to show the rich silvery colour of the air-bladder, or intestines ; irides bright yellow, green towards the crown ; lower jaw longest ; dorsal and anal sheathed by a row of scales at their base.

CLUPEA *macrocephala*. Great-headed Sprat.

Inhabits, in certain seasons, the Mersey, near Liverpool.

It is now near twenty-three years since the *Clupea*, now to be described, was found by me, in some abundance, in the river Mersey, during the spring of 1817, at a time when I had contemplated a general work on British Ichthyology ; an undertaking that was laid aside on embarking, the same year, for Tropical America. The following description, with an accurate drawing, was then made, and their correctness verified by the examination of numerous individuals. It seems to me a species totally different from any yet recorded, whether of Britain or of the Mediterranean. I shall first call the reader's attention to its general characters, and then to such as separate it from its allies.

The largest-sized individual met with, did not exceed four inches three tenths. On comparing its general form with that of the common sprat, the head is considerably larger, the eyes further removed from the snout, the lower jaw longer, and the belly much narrower. The length of the head, when measured from the tip of the upper jaw, is just one-fourth the length of the body exclusive of the caudal fin ; the under jaw is much the longest, and there are a few recurved teeth in the palate ; nostrils simple, placed centrally between the eye and tip of the muzzle ; tongue narrow, thick, pointed ; dorsal fin exactly central between the two extreme points of the whole length of the fish, rather higher than it is long ; ventral corresponding to the centre of the dorsal ; pectoral rather longer than the length both of the dorsal and ventral, which latter is shorter in its extent than the dorsal ; ventral small, without any appendages ; caudal deeply forked ; belly carinated, and sharply serrated ; number of the vertebrae fifty-five. COLOUR. — Crown and back changeable blue, with iridescent reflections ; sides bright silvery ; scales very deciduous, smaller in proportion than those of the common sprat.

The perfectly central position of the ventral fin, and the number of vertebrae, which are fifty-five instead of forty-eight, together with the large size of the head, &c., separates this from *C. sprattus*; the more backward position of the dorsal distinguishes it both from the white-bait and Twaite shad of Mr. Yarrell, although both have nearly the same number of vertebrae; from the other British *Clupiadae*, its differences are too obvious to be noticed.

ENGRAULIS *clupeoides*. Sprat-like Anchovy.

Belly carinated, but not serrated; mouth and jaws entirely smooth, and without teeth; anal fin of thirty rays.

Dorsal 14; pectoral 16; ventral 7; anal 30; caudal 18.

Inhabits the coasts of Pernambuco. (January, 1817.)

Total length about seven inches; muzzle rather pointed; eyes placed as near as possible to the tip; irides silvery yellow; nostrils round, and placed nearest the eyes; gill-membranes 12-rayed, the apertures remarkably large, extending all round from behind the eye to near the tip of the lower jaw; scales large, deciduous; dorsal fin in the middle of the back; pectoral fins close to the belly, having at their base, both above and below, a large single lengthened pointed scale; ventrals very small, not half the size of the pectorals, placed close together, and nearly united at their base; vent central, immediately under the first dorsal ray; anal commencing close behind the vent, long, and gradually becoming narrower, the base with a thin scaly sheath extending the whole length; caudal deeply forked; tongue not visible; the pectinations of the gills very long, slender, and rigid. COLOUR.—Crown and back pale blue; sides silvery; fins dusky. It is impossible to determine from the rude figure of Sloane and his imperfect description, whether this is the *En. edentatus* of Cuvier, who merely cites Sloane as his authority; the probability being that more than one species is without teeth.

LEPTODES *Siculus*.

Scales hexagonal, unequal, placed in longitudinal rows, of which three are on each side; the middle row small, the upper and under transversely lengthened; caudal fin deeply forked.

Viper-mouthed pike? Shaw, Gen. Zool. vi. p. 120. pl. 111.*

The loss, or the neglect and subsequent destruction, that has attended my Mediterranean collection of fishes, sent to the British Museum in 1817, must plead my excuse for the imper-

* This figure, which seems to have been copied from Catesby, represents the scales all of the same size; that is, similar to those of the middle lateral row of mine. I, of course, only describe this as a distinct species provisionally; for, without seeing both, it is impossible to say whether Catesby's figure is correct. But so many errors have arisen from the plan of *generalising* species, that I prefer to point out real or apparent distinctions, and leave the rest for time to determine. See Vol. I. p. 304.

fection of several of the descriptions in this volume, more especially of this most extraordinary fish, of which either one or two very perfect specimens were in spirits. I can hear of no example in any of the collections of this country, and not having taken any notes after executing a coloured drawing from the fresh fish, a reduced copy of which has been already given†, I can only add such particulars as that furnishes.

The scales of the body are very peculiar; they do not lay upon each other, as in ordinary fishes, but are joined together at their margins; their form is hexagonal, and they are arranged in longitudinal rows of different sizes; three of these rows are on each side; the upper and the under ones are twice as long as they are broad, and are placed transversely; those in the middle row are less than half the size, and their sides are nearly equal; towards the end of the body, however, these inequalities are lost, and they all become of the same size. The dorsal fin, as well as the anal, have the rays, as it were, upon fleshy peduncles; the first ray of the former is near five times the length of the others, and is terminated by a narrow spatulate membrane; the total number of rays appears to be about seven, while those of the anal are eight; both seem to be much branched; the ventral fins are placed exactly half-way between the tip of the under jaw, when opened, and the end of the anal fin; they are as long and as pointed, although not so broad, as the pectoral; the caudal fin is forked, and deeply cleft to its base, the divisions much pointed. The colour is very peculiar; the back is blackish, or very dark grey; the belly of the deepest black; and the sides light purple strongly silvered; the fins are buff-colour; the sides of the head silvery, and the eye yellow. The total length is about eight inches.

GADUS furcatus (fig. 71. Vol. I.) Fork-tailed Cod.

Body compressed; head rather small, rounded, and obtuse; lateral line curved; dorsal fins three; vent under the commencement of the second; caudal fin deeply forked; ventral long, pointed, of three rays.

Dorsal 12, 22, 12; ventral 3; anal 29, 14; caudal 22.

Inhabits the western coast of Sicily; rare. (January, 1815.)

Length of the specimens examined about six to eight inches: upper jaw rather the longest; the single cirrus on the lower jaw is about half as long as the head; eyes large; lips thin; teeth in the jaws and palate minute, and very sharp; gill-membrane 5-rayed; irides above dark blue; body compressed, broadest between the anal and second dorsal fin; the scales so minute as to be imperceptible to the eye; the first dorsal fin triangular, much higher than long; ventral fins pointed, almost cylindrical, as long as the pectoral, of three rays only, the last of which is very small; last dorsal fin only one-third as long as the second, and equal with the second anal; caudal forked to the base. COLOUR. — Above pale drab or isabella; sides silvery; lower fins paler; lateral line with the anterior half curved, the hinder straight; the greatest breadth of the body is one-fourth the total length from tip to tip.

GADUS blennoïdes. Blenniform Cod.

Ventral fin lengthened, cylindrical, of two strong rays,

the others obsolete; caudal fin slightly lunate; vent beneath the middle of the first dorsal fin; anterior portion of the lateral line abruptly curved, the hinder straight.

Dorsal 12, 21, 17; anal 30, 18; pectoral 14; ventral 5.

Inhabits Sicily.

The general form and appearance of this fish closely resembles the *Gadus lusca* of our own coasts, but the first anal fin is not advanced so much towards the head, and it commences immediately behind the vent, so that both may be said to be on a line with the middle of the first dorsal fin; there is no spot whatever at the base of the pectoral; the two anal fins are very little in advance of the two hinder dorsals; the three hinder ventral rays of these fins are almost imperceptible, and indeed, in some specimens, they seem altogether obsolete; the first dorsal fin commences rather *before* the base of the pectoral — not a little *behind* it, as in *G. lusca*; on the upper jaw, which is very slightly longer than the under, are six minute punctures; and beneath the lower jaw are nine others; teeth* small, sharp, and distinct, placed in a single row; gill-membrane 7-rayed; the ventral fins are so thick that I found it impossible to make out whether the two first rays were united towards their base, or distinct. COLOUR. — Irides silvery, upper parts light drab or isabella, lower silvery white; the fins are all very thick and fleshy, particularly the caudal and ventrals; the cirrus beneath the lower jaw is only half the length of the pectorals. The specimens examined did not exceed seven inches. The lateral line, after it ascends abruptly, takes an undulated direction to the nape; the ventrals are considerably in advance of the pectorals, and are rather longer.

MERLUCIUS *sinuatus* (fig. 73. Vol. I.)

The second dorsal and the anal long, of equal length, and sinuated or narrowed in the middle.

Dorsal 10, 38; pectoral 12; ventral 7; anal 38; caudal 20.

Common on the Sicilian coast in the spring.

This is a most voracious fish, and, I suspect, grows to a much larger size than the small ones that came under my observation. In the stomach of one only six inches long, were two entire blennies, each measuring an inch and a half. This is probably the species known to Rondeletius, and the older writers, which the moderns have supposed to be the common hake of our northern seas; at least I never saw this latter in the Mediterranean.

Head bony, the sides compressed, the crown depressed, exactly one fifth the entire length of the fish; gill-membrane 7-rayed; mouth large; lips not fleshy; each jaw with two rows of sharp, long, incurved, and distinct teeth; the first row short, while those in the palate are small and in a single row; tongue short, obtuse, and smooth; lateral line commencing at the nape with four small tubercles, gradually curving downwards until it reaches the middle of the body, where it becomes straight towards the half of the length; eyes large; caudal fin slightly lunated; ventral fin rounded,

* The *G. lusca*, according to Mr. Yarrell, has several rows of teeth in the upper jaw, but only one in the lower. *Brit. Fishes*, vol. ii. p. 160.

as large as the pectoral: first dorsal triangular, rather higher than the second. COLOUR.—Upper parts ash-colour; sides and under parts of the head and body silvery; irides silvery and golden; scales very small. OBS.—Besides the difference in the shape of the dorsal and anal fins, this species differs from the British hake in having the head shorter, and the teeth in two rows instead of one, and the scales, instead of being “large,” are very small. The first ray of the anal is very small; the second dorsal and the anal commence and terminate on a line with each other.

MOTELLA *fusca*. Chestnut Rockling.

Entirely dark blackish chestnut; belly white; cirri three, two above and one below; lateral line marked with round whitish spots.

Dorsal 1, 2, 57; pectoral 12; ventral 6; anal 47; caudal about 20.

Very common round the rocky shores of Palermo, where it appears solitary: it is very voracious, feeding not only on shell-fish and crabs, but on fuscii: the former I have often found entire in the stomach, and of a large size for that of the fish, which never exceeds seven or eight inches in length, and is usually much smaller.

Length 6 to 8 inches; head depressed, and marked with punctures between the eyes, before the nostrils, and round the cheeks and nape; lower jaw shortest; teeth small, incurved, sharp, distinct; two rows in the upper and one in the lower jaw; those in the palate placed in an angular space; nostrils double, the hinder pair somewhat tubular, the anterior having a pair of cirri immediately behind them; another single cirrus is at the tip of the lower jaw; the first or false dorsal is in a deep groove, with a longer filamentous ray in front, and followed by numerous others, connected only at their base by a membrane. The ventral fins are of five rays, the two first subulate and thick, and partially disconnected; the other three united to their tips, and very small: the second much the longest. Body much compressed beyond the vent, and covered with very small scales; these extend to the base of the fins, which are very thick. The second dorsal is broader than the anal; caudal rounded, ventral almost terminating in a line with the pectoral, which is also rounded; anal commencing in a line opposite the eighth dorsal ray, terminates with it, close to, but not united to the base of, the caudal. Lateral line beginning at the hind head, curved at the vent, from whence it becomes straight, and marked by white dots, which become more distant and nearly extinct near the caudal fin: a few other white dots are sometimes scattered on each side. The length of the whole fish, compared to the breadth, is as 1 to 7. COLOUR uniform, chestnut brown, nearly black, the fins being darkest; sides of the head lighter, with a yellow cast; belly nearly white; irides dark brown, but soon after death they change to yellow.

PHYSIS *longipennis*. (Vol. I. p. 322. fig. 75.)

Ventral fins very long, unequally forked, the longest filament reaching to half the length of the body; a single cirrus on the lower jaw.

Dorsal 9, 62; pectoral 12; ventral 1; anal 53.

Inhabits Sicily.

Having already given a correct outline of this species, Vol. I. p. 322. *fig. 75.*, it will be unnecessary to describe its form. The lower jaw is shortest, having ten or eleven punctures on the under part, and six others on the upper jaw; gill-membrane 5-rayed. Body above fulvous brown, the sides and belly silvery white; the second dorsals and hind part of the anal edged with a line of black; caudal fin blackish; a black spot in the middle of the second dorsal; the upper half of the first dorsal is also black.

PHYSIS *Siculus*. (Vol. II. p. 301. *fig. 95.*)

Cirrus on the nostrils, small on the lower jaw, conspicuous; ventral fin only reaching as far the vent.

Dorsal 8, 60; pectoral 15; ventral 2; anal 56; caudal 25.

Inhabits Sicily.

A correct outline of this second Sicilian species is given at page 306., which will at once show how much it differs from the last. The longest division of the ventrals only reaches as far as the vent, and there is no black upon the fins. The colour is a very dark and rich chocolate or rufous brown; the fins being nearly black, and the sides of the head and the dorsal and anal tip with white, and body having a yellow gloss. After the fish has been dead some time, the colours fade, and the fins then appear edged with black; the anterior nostril has behind it a very short skin resembling a cirrus. Total length generally about three-quarters of a foot.

FELICHTHYS *filamentosus*. Sickle-finned Silure.

Cirri four; dorsal and pectoral fins with the spines serrated, and surmounted by cartilaginous and articulated filaments; pectoral much larger than the ventral fin, which has only six rays; lower fins white.

Dorsal 1-8; pectoral 1-14; ventral 6; anal 20; caudal about 20.

Estuaries of rivers near Pernambuco, Brazil.

Average length about two feet; body thick, sub-cylindrical; head suddenly descending, and flattened, bony, but covered with the common skin; muzzle broad and rounded; mouth large, opening horizontally, and rather beneath the upper jaw, which has, at each angle of the gape, a long compressed sinewy cirrus, which extends as far as the termination of the first dorsal fin; lower jaw with another pair of cirri, not one-fourth the length of the upper, round, fleshy, and placed beneath the tip of the jaw; *teeth* numerous, sharp, and very small, placed in two broad rows on the upper jaw, and in one on the under; *tongue* very large, thick, cartilaginous, and rounded; branchial membrane 5-rayed, the aperture small; eyes small, apparently covered with a skin; pectoral fin close to the branchial opening and to the belly; the first ray composed of a strong compressed spine, with barbed serratures on each side: to this is united, near the end, and on the inner side, a compressed, hard, but pliable and articulated filament, which is as long as the spine itself, and extends to beyond the vent; the other rays are not lengthened, but rapidly diminish. The first dorsal is

placed almost exactly between the pectoral and the ventral ; it is smaller than the pectoral, and more falcate, but constructed in the same manner ; the spine, however, is much smaller, and not more than one-third the length of its filament ; it is serrated only on the outer or front side : this filament extends to the second or adipose dorsal, which is small, somewhat hatchet-shaped, and placed so as to terminate in a line with the anal fin ; the vent seems much nearer to the caudal than to the head, but it is exactly central between the two extremities of the fish ; that is, the tip of the snout and that of the tail fin : close before the vent is the ventral, which is small and triangular ; behind the vent, and situated half-way between that and the base of the caudal, is the anal fin, which is longer than the dorsal, and the margin considerably falcated or lunated ; the caudal is deeply forked, the upper lobe always being manifestly longest ; lateral line straight nearest the back, and commencing only beneath the first dorsal. COLOUR. — The upper parts cinereous blue, the lower silvery white ; fins dusky cinereous ; ventral and anal white ; pectoral nearly pale ; the upper cirri are silvered.

In general shape this has a considerable resemblance to the *Silurus Bagne*, of Bloch (pl. 365.) ; but the ventral fins are considerably shorter than the pectorals, even on omitting the first ray of the latter ; whereas in Bloch's fish the very reverse of this is delineated : in his the lower fins are red ; in ours white : the dorsal filament, also, is shorter, but this is not of much consequence. Dr. Shaw, who describes the *S. bagne* from Bloch's figure only, has made a singular mistake in saying, of Bloch's fish, that it has a single insulated filament rising from the back, this being nothing more than the end of the other pectoral, which is thus represented in the back ground, or other side of the figure. The formula of the rays, also, are different in almost every instance. Bloch's fish has the following rays : Dorsal 1-8 ; pectoral 1-12 ; ventral 8 ; anal 24 ; caudal 18.

SILURUS *laticeps*.

Cirri eight ; one pair at the angle of the mouth, one on the upper, and two on the lower jaw, the two first pair of equal length ; spine of the pectoral fin smooth ; anal fin joining the base of the caudal ; head very broad.

Inhabits India.

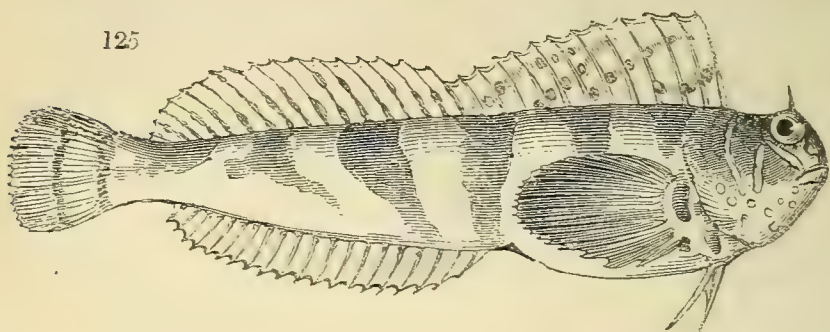
This species so closely resembles the *Silurus fossilis* of Bloch, that I do not feel confident it is really distinct. Such doubts will always attend descriptions too loose for the accuracy now necessary in science. In the figure of Bloch's, however, there is a considerable interval between the end of the anal and the base of the caudal ; but in our fish there is none. The upper pair of cirri are also represented as much shorter than those at the gape ; but in this both pair are of equal length : the head is remarkably broad, exceeding, in this respect, our *Silurus biserratus*, figured in Hamilton's Gangetic Fishes, pl. 36. f. 46.

BLENNIUS *ornatus*. (fig. 125.)

A simply pointed cirrus over each eye, and a minute palmate membrane at the nostrils ; head with lines

and dots of bright blue ; tips of the anal rays pure white.

125



Dorsal 12, 16 ; pectoral 14 ; ventral 2 ; anal 19 ; caudal 12.

Inhabits Sicily.

This most beautiful little fish is closely allied to *Blennius Sphynx* (Hist. Nat. des Poiss. xi. 226. pl. 321.) ; but it is longer in proportion. The bands on the body are not margined by a line of silver, but of bright blue ; there are no silvery spots on the dorsal or caudal, and the general ground-colour of the whole fish is not yellowish green, but olive brown. There is no "large ocellated spot, bordered with red, on the temples," as in *B. Sphynx*, nor any "silvery lines, bordered with black, on the sides of the head and operculum ;" these lines being simply bright blue in the present species, which is here figured of the natural size.

DESCRIPTION. — Teeth sharp, long, close together ; a long, sharp, and incurved canine tooth in each jaw near the gape or angle of the rictus ; nostril single, with a very small palmate, four-cleft membrane ; another, over each eye, is simple, rounded, and pointed at the tip. The above figure, taken from a fresh specimen caught on the coast of Palermo, renders a more lengthened description of the fins, &c. unnecessary. COLOUR. — Body and fins, except the ventrals, which are yellow, variegated with different shades of rich olivaceous brown ; the six dark wavy bands on the body are edged with a bright line of blue ; head, throat, and base of the pectorals with dark irregular bands, the cheeks having several lines, and the lips and front speckled with bright blue. The bands and spots on the dorsal and caudal fins are dark purplish brown ; anal pale rufous brown, with a series of white spots, the margins being black, and the tips of the rays white ; all these rays are simple ; those of the pectoral, nearest the throat, are much the strongest ; and all these, as well as the anal rays, extend beyond the membrane which connects them : ventral fins orange yellow, divided at the end ; belly whitish ; lower part of the sides, between the bands, yellow ; caudal margined with yellow. Palermo, 10th Feb. 1815.

ELEOTRIS *Siculus*.

Pale rufous, spotted with darker ; dorsal fins whitish,

with reddish bands and spots ; three first dorsal spines equal.

Dorsal 6, 14, the last ray double ; anal 12, the last double.

Inhabits Sicily.

DESCRIPTION.—Habit and size of *G. cruentatus*. Scales rather large and very rough, which seems to be caused by their not laying close upon each other ; those on the crown small. On each side of the head, behind the cheeks, are two punctures. First dorsal commencing just behind the base of the pectoral ; the three first rays equal, and rather higher than those of the second dorsal ; the three next graduated ; the membrane of the sixth reaching to the base of the first ray of the next fin ; second dorsal commencing just before the vent, and of equal breadth throughout ; pectoral fin as long as the first dorsal ; second dorsal almost twice as long as the first, commencing rather before, but terminating even with the anal, and both of the same breadth ; caudal fin ovate ; ventral fin rather longer than the pectoral, but not reaching the ventral aperture, which is immediately under the second ray of the second dorsal ; ventrals united at the base by a slight membrane. COLOUR.—Entirely pale rufous, with irregular darker spots on the middle of the sides placed longitudinally ; sides of the head spotted, and the body clouded with whitish ; dorsal fins, with the membrane, very delicate ; the first is dark red, with four transverse undulated lines of whitish, which lines are sometimes a little confluent ; the second dorsal has merely four rows of darker reddish spots on a whitish ground ; ventral and anal fins immaculate, and covered with a milk-white skin, which easily comes off ; pectoral and caudal fins with small, faint, red spots ; irides yellowish, with four brown spots ; mouth low ; jaws equal. Palermo, 1817.

OPHISURUS *pictus*.

Light fulvous brown, with white spots scattered on the nape, before the dorsal fin, and white irregular bands on the head and muzzle ; hinder portion of the dorsal and anal fins margined with black ; belly white.

Inhabits Sicily.

The general form is like that of the conger eel, and the branchial aperture is similarly placed, but the nostrils are much more tubular ; and although the dorsal and anal fins reach to the tip of the tail, they do not pass round it, so as to unite. All the bands on the head are transverse before the eye, but two or three of those behind are longitudinal, yet broken and irregular : the round white spots are scattered in front of the dorsal fin, which commences immediately above the end of the pectoral ; and there are three or four above the latter fin on the lateral line : the anal fin is about two-thirds the total length of the fish, which measured 1 foot 9 inches ; the ground tint is fawn colour, the pectoral fin and the snout tinged with pink.

OPHISOMA *obtusa*.

Snout rounded, obtuse ; dorsal fin commencing much behind the end of the pectoral ; fins white, margined by a black line.

Inhabits Sicily.

In the specimen here described, which measured 70 inches, the dorsal fin

commenced $10\frac{1}{2}$ inches from the tip of the snout, while that of the anal was four inches from the same part: the branchial aperture is exactly half-way between the first dorsal ray and the anterior margin of the eye: the pectoral is about half as long as the head. The general colour is of a cinereous brown.

OPHISOMA *acuta*.

Snout pointed; nostrils tumid, forming an elevated tubercle; dorsal fin commencing with the pectoral; body pale olive brown, the sides richly silvered; the pectoral fin blood red.

Inhabits Sicily.

Total length 10 inches. The dorsal fin commences a little more than an inch and a half from the tip of the snout, and even with the base of the pectoral: the vent is nearest the head, and is four inches and a half from the snout: dorsal and anal fins uniting round the tail, whitish and transparent, with an orange-brown margin: the sides of the operculum are richly silvered, and the tip of the muzzle is suddenly pointed.

LEPTOGNATHUS *oxyrynchus*.

Dorsal fin commencing considerably behind the end of the pectoral; lateral line, on the anterior part, marked by black dots.

Inhabits Sicily.

Total length 3 feet 9 inches. The head has already been figured (Vol. I. p. 221.) a little more than half of the natural size, and will thus render its detailed description unnecessary. The distance from the tip of the snout to the base of the pectoral is three inches and a half, and to the commencement of the dorsal five and a half: the vent is fourteen inches from the snout, and the first dorsal ray is an inch and three-quarters from the base of the pectoral; the anal and dorsal fins terminate half an inch from the tip of the tail, and are there enlarged: the colour is dark fulvous brown, paler towards the belly: the lateral line begins on the top of the crown, and undulates downwards to the pectoral fin, where it reaches the middle of the sides.

CAPRISCUS *niger*.

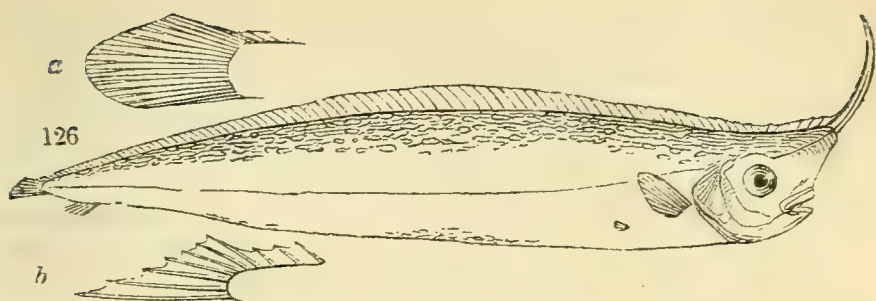
Entirely black; caudal fin even.

Second dorsal 33; anal 29 or 30; caudal 9.

Lower jaw with eight teeth, the two middle largest, and with even edges; those on the sides with an obtuse point, curved inwards; pelvis very short, reposing in a groove; first dorsal spine obtuse, mucronate, the other rays hid in the groove; belly, between the pelvis and the vent, prickly: anal fin commencing behind the dorsal, but terminating even with it; total length $4\frac{1}{2}$, and from the snout to the base of the pectoral $1\frac{1}{4}$. From a dried skin, formerly in the Leverian Museum.

LOPHOTES *Siculus*.

Dorsal fin narrow, of about 120 rays; caudal fin oblique, of seven rays. (*fig.* 126.)



During my residence in Sicily, a single example of a fish closely allied to, if not the same as, the *Cepedianus* of Cuvier, was captured off Monte Pelegrino, in 1815, by some fishermen, who considered it such a curiosity, that it was presented to the king. His majesty caused a painting to be made of it, a copy of which, in water colours, executed by the same artist, is now in my possession. My friend Rafinesque, who saw the fish itself, and through whom this drawing was procured, assured me of its accuracy. A greatly reduced outline is here annexed.

The first dorsal ray, or, rather, horn-like process, is, like that of *Cepedianus*, somewhat three-sided, but the tip is not truncated, but pointed; the dorsal fin is narrower, and the rays much more distant from each other; so much so, indeed, that the drawing expresses not more than 120, whereas those in *L. Cepedianus* are stated to be 230. The caudal fin, in the Sicilian fish, is oblique *b**, with only seven rays; in the other this fin is ovately rounded *a*, and the rays are seventeen. The colour of both seems to be much the same, and therefore, under these circumstances, although I venture to distinguish the Sicilian fish by a different name, it is merely until further observations determine the point at issue. It was entirely unknown to all the Palermitan fishermen, and measured $5\frac{1}{2}$ palms in length, by $1\frac{1}{4}$ in breadth; the weight was 14 rotola, and the length of the horn $1\frac{1}{2}$ palm, Sicilian measure.

There is an old stuffed specimen of a *Lophotes* in the British Museum, but too much injured to be of any service in throwing light upon this question.

CEPOLA *rubescens*.

Caudal fin lanceolate, of equal length with the head, and of eleven rays; first and second dorsal ray not approximating; ventral fin immediately under the pectoral.

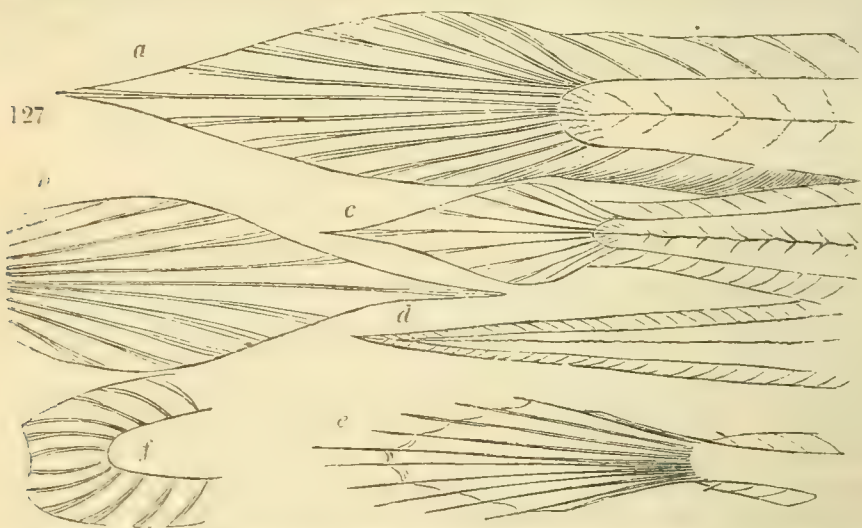
In the British Museum.

It is not surprising that the descriptions left us by Lin-

* This form, as well as the truncated end of the horn in Cuvier's figure, may probably have originated from accident.

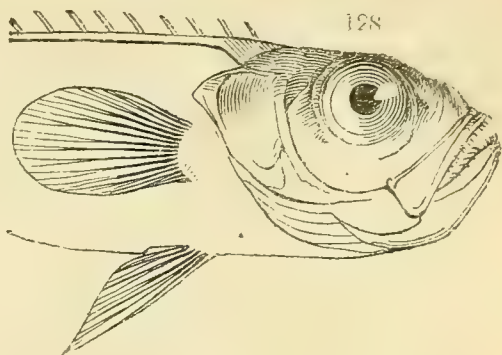
næus and Bloch, of the only two species of *Cepola* then supposed to exist, should be so vague as to render their differences very questionable; for in those days slight modifications of form were not attended to. But we must confess our surprise that MM. Cuvier and Valenciennes, in their chapter upon this genus, should commence with assuring us that they know of but one species found on the coasts of Europe, namely, the *Cepola*, which they have figured as the Linnæan *rubescens*. This name, as originating in the great Swedish naturalist, we shall retain, using it to designate that species which seems to be the most common on the more northern coasts of Europe. But it will subsequently appear, that this name cannot be given to the figure in the general ichthyological work of Cuvier, inasmuch as it not only differs from the British fish, but from all others we have yet met with. It seems, in fact, either to be an entirely new *Cepola*, or to have been drawn from a dried and injured specimen. The species of the interesting group we shall now briefly describe, are all natives of the Sicilian or British coasts; most of them were examined in a recent state, and specimens, in spirits, were sent to the British Museum for subsequent examination. The fate of this interesting and to us invaluable collection, has been more than once adverted to. Out of near 200 specimens, then in beautiful preservation, not more than a dozen can now be found; so that, but for our notes and drawings, these discoveries would have been lost to science.

A general uniformity, not only of shape, but of colours, appears to run through the whole of this group; the specific characters resting for the most part on the form and rays of the caudal fin (*fig. 127.*), which, on at-



tentive examination, will be found to vary in a most remarkable manner. These characters, so difficult to determine in preserved specimens, either wet or dry, may in some measure account for the universal belief of there being but one species.

The *Cepola rubescens* of Linnæus was probably a northern fish, and we accordingly retain that name to the one figured and described by Montague.* It is at once known from the following, by the specific characters above mentioned. We may observe, in addition, that the dorsal fin commences before the ventral, the base of the latter being in a line with the second ray of the former. Specimens dried, and in spirits, are in the British Museum, from whence these remarks were made; but not having seen this species in a fresh state, I cannot describe its colours. The annexed cut will show the relative positions of the above mentioned fins, while that at *fig. b* represents the caudal fin.



CEPOLA *longicauda*.

Caudal fin distinct, lanceolate, more than double the length of the head, and composed of thirteen rays.

Inhabits Britain. Zool. Museum.

Several specimens of this fish, captured on the British coast, are in the Zoological Society's collection; and another, said to be from the Bay of Naples, in that of the British Museum. The correctness of this latter locality, however, I am inclined to doubt.

The ventral fin is of the same length as the pectoral; the chief characters rest on the remarkable length of the caudal fin, which is more than double that of the head; the close proximity of the two first rays of the dorsal is very remarkable, both in the Zoological and British Museum specimens; the vent was on a line with the ninth dorsal ray. I did not observe this species in the Mediterranean.

CEPOLA *novemradiata*.

Caudal fin lanceolate, rather longer than the head, of nine distinct rays; ventral fins commencing on a line with the dorsal.

Very common in the Sicilian seas. (*fig. 127. c.*)

Having seen numerous fresh individuals of this species, it can be described more fully than the two preceding. It is particularly common in the spring on the coasts of Palermo, and is there sold in the fish-market.

* Montague's account, however, is not sufficient for me to say that it unequivocally belongs to this species; he says, for instance, that the ventral fin is a little before the base of the pectorals, but in the British Museum specimens it is immediately under.

The general colour of the body is a beautiful vermilion pink, or flesh colour; the sides with silvery blue, transverse stripes, but not defined, and changing with the position; belly the same; the dorsal, anal, and caudal fins are fine orange-yellow in the middle, the base light pink, and the margin edged with a line of darker red; pectoral fin nearly white; ventral entirely so; at about the sixth dorsal ray, in the middle of the fin, is a bright red spot, sometimes almost broken into two, and always with the margins undefined. The lateral lines, as in all the species of this genus we have yet seen, commences at the upper extremity of the operculum; and then, by a short sudden curve, reaches close to the base of the dorsal, and runs parallel to it the whole length of the fish. In regard to the situation of the fins, the ventral begins directly under the dorsal, and very slightly in front of the pectoral: it is pointed, the second ray having a short filament, but even this does not reach as far as the vent; the caudal fin (*fig. 127. c*) has a central ray, and only four others on each side, making the total number nine. By this it is further distinguished from our *rubescens*, which has eleven such rays, while the comparative shortness of the caudal fin distinguishes this from *longicauda*.

CEPOLA *attenuata*.

Caudal fin obsolete, not separated or distinguishable from the pointed extremities of the dorsal and anal.

Inhabits the coasts of Sicily. (*fig. 127. d*.)

Among my Sicilian drawings I find the finished outline of a *Cepola*, having the tail terminating in a point (*fig. 127. d*), as in the genus *Ophidium*, without any appearance of a distinct dorsal fin. Its general shape and colour was that of the last, except that the dors 1 has two spots, one on the seventh, which is the largest, and the other on the ninth ray; the pectoral fin terminates in a line with the vent, and is placed a little behind the ventral, this latter being directly under the commencement of the dorsal. The specimen was preserved in spirits, and no further notes taken, so that further information will be wanted to complete this description. It may be remarked, however, that in my drawing the anal fin is much narrower than the dorsal, and the vent is immediately under the seventh ray of that fin.

The figure of Mr. Yarrell's *Cepola rubescens* agrees with this in the deficiency of a distinct caudal fin; but it may still be a question, whether both instances may not have arisen from inaccuracy; since the fuciform shape of this fin in the other species only becomes apparent when the tail is very carefully spread out in the fresh specimen. I may possibly, though not probably, have omitted to do this in my Sicilian *Cepola*.

CEPOLA *truncata*.

Caudal fin truncate, and slightly lunated; of six rays only, not longer than those of the dorsal and ventral.

Inhabits Sicily (*fig. 127.*)

Of this most singular species I never procured more than one specimen, caught on the coast of Palermo. Its size, colour, and general appearance, was that of the last, even to the red spot on the dorsal, but the tail was much thicker, and the caudal fin, as here represented. (*fig. 127. f*). Had the rays of this fin been the same in *number* as that of *C. novemradiata*, a suspicion might have been entertained that this had been a mutilated specimen, but the rays were actually only *six*, and the margin of the membrane quite entire. Added to this, the base of the ventral is under the second, and not, as in that, under the first dorsal ray; while the pectoral fin, instead of not reaching to the vent, terminates exactly in a line with it.

CEPOLA *Gigas*.

Ventral fin exactly beneath the pectoral, but longer, and reaching to the anus; anal fin commencing on a line between the eighth and ninth dorsal ray; caudal fin — ?

In the British Museum.

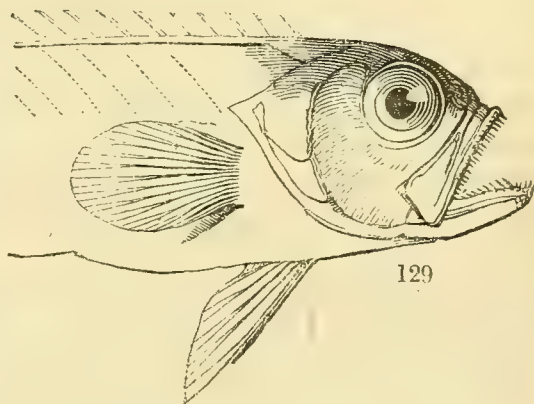
The only specimen existing in our national collection is, unfortunately, deprived of its caudal fin. The unusual length, however, of the ventrals, which reach to the aperture of the anus, seems to be a positive mark of distinction, particularly as this fin is longer than the pectorals, a disproportion which I have not observed in any other. The colours are completely gone, and the specimen, apparently, is very old. It is the largest of any *Cepola* in that collection; but I omitted, unluckily, to take the measurements.

CEPOLA *jugularis*.

Pectoral fin reaching to the anus, and placed considerably behind the ventral fin, which commences in a line with the first dorsal ray. (*fig. 127. a.*)

In Mr. Yarrell's collection (the *Cepola rubescens** of Risso.)

A finely grown and well dried specimen of this *Cepola* was obligingly communicated to me by Mr. Yarrell. It shows a great peculiarity in the situation of the ventral fin, which is placed so much in advance,



* At *fig. 127. e*, is an exact copy of the tail of Cuvier's *C. rubescens*, which it is easy to perceive does not agree with any one of the species here described; not only in the number of the rays, but also in their being represented as extending beyond the membrane.

that the last of its rays is barely on a line with the base of the pectoral : it is, of course, shorter than the belly, and therefore does not reach, as in *Gigas*, to the aperture of the vent : the first of its rays is also immediately under the first dorsal ; hence it differs from *rubescens*, where the ventral is under the *second* dorsal ray. The caudal fin has thirteen rays ; and is not quite double the length of the head. Mr. Yarrell received this from near Nice, under the name of *rubescens* ; but it cannot be either our *rubescens* or *novem radiata*.

CEPOLA *variegata*.

Body with waved, transverse, clouded spots ; pectoral fin reaching beyond the vent ; ventral fin shorter and pointed ; scales conspicuous.

Inhabits China. Zoological Society's Museum.

A wet specimen of this fish, not in the best condition, is in the collection of the Zoological Society. Although the tail is injured, it appears to me readily distinguishable from all the foregoing by the spotted and clouded surface of the body, and by the relative position and proportion of the lateral fins. The ventral fins are shorter than the pectoral, having the first (or second?) ray ending in a filamentous point, which exactly reaches to the vent. The pectoral fin is placed just under the interval between the second and third dorsal rays ; it measures seven-eighths of an inch, and reaches beyond the vent. The caudal fin is partly injured, so that the number of its rays cannot be correctly ascertained ; but sufficient is left to show that it was rather short and lanceolate. The total length of the specimen is one foot ; and the shape of the head, body, &c. presented no obvious difference from the *C. rubescens*, except that the scales appeared, both to Mr. Waterhouse and myself, proportionately much larger.

FIERASFER *acus* (fig. 130. a.)

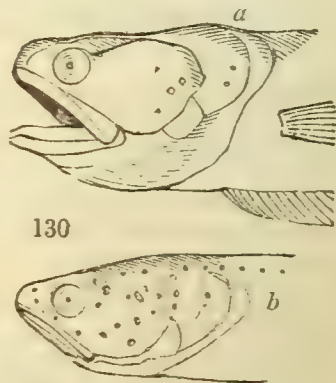
Body sub-hyaline, pale red with numerous waved transverse lines ; throat and lower jaw without spots.

Ophidium imberbe? *Auctorum*.

Fierasfer imberbe? Cuv.

———acus. Risso.

Of this remarkable and rare fish, hitherto so little understood, and so imperfectly described, I was enabled to make a coloured drawing and description at Palermo, soon after the specimen was caught. An outline of the former has been already introduced at page 260.



Shape large, attenuated, beginning gradually to diminish from just behind the pectoral fin, and to narrow to a fine point. The body is nearly trans-

parent, so that the vertebræ and the articulations are distinctly seen ; the head is rounded, obtuse, and broader than the body ; nostrils small, oval, seated on a prominence before the eyes ; mouth large, bony ; lips thin ; teeth minute, much incurved, and in about two rows—in front of the palate there is a short row of others ; tongue pointed, but the tip rounded ; eyes large, irides richly silvered, the upper part blackish : when the fish is alive, the pupil is scarcely seen, being turned downward, so that the upper or black part of the irides occupies one-half of the eye : when just dead, I observed it, in the middle, appearing as a small black speck ; but after the fish had been dead some time, to my great surprise the pupil became much larger, that is, as big as the head of a large pin : cheeks fleshy, gill-covers of three pieces, richly silvered, and margined by a thin skin ; the aperture large ; the vent is close to the throat, on a line with the hinder margin of the gill-covers, and considerably in advance of the pectorals ; so also is the commencement of the anal fin, which begins close to the aperture, and extends to the tip of the tail : this fin gradually becomes broader until it reaches beyond half its total length, it then rapidly narrows. The dorsal fin commences at one-fourth the distance from the tip of the snout to the tip of the tail ; it is so remarkably narrow, especially at its two extremities, that it can only be detected at these parts by very close examination. The anal fin is very fleshy, or rather gelatinous at its base, where it is of equal thickness with the body, it then graduates to a fine edge. Pectorals small and rounded. There is no apparent lateral line, but an external indentation follows the course of the back-bone on each side. The body, towards the head, is compressed, but less than in the *Cepolæ* ; and the gill membrane has seven rays.

The COLOUR of this fish, when just caught and alive, is as follows :—The general tint is light red, marked with waved, zigzag, transverse lines, of a darker or brick red ; these are deepest on the back, where they are separated into spots ; the head is dark above, with a few reddish spots on the sides. On the under part of the indented line already spoken of, and commencing at the pectoral fin, is a row of from nine to ten oblong square spots placed transversely, and gradually diminishing in size : when the fish is alive, they are of a most beautiful golden hue, but after death their splendour fades, and they then become pale and silvery. My drawing also expresses a series of very small spots, placed in the same line, but only for about 2 inches at the end of the tail, and not larger than a pin's head ; but as no mention is made of them in the original description, of which the above is a transcript, I can only conclude they were shining spots of the same description. The total length of two specimens captured, was from $6\frac{1}{2}$ to 7 inches. The fins are entirely white ; the anal rays by far too numerous and too delicate to admit of being counted. . . .

FIERASFER *maculata* (fig. 130. b.).

Head and forepart of the body with numerous blackish spots, gill-covers golden.

I know not whether to record this as a remarkable variety of the above, or as a distinct species. I only met with a single specimen ; and having drawn its head, already copied in this work, and made the following notes, it was put into spirits for the British Museum, and is now lost. " Since writing the above, I have found another specimen, in which the colours were very different : it was much darker, being dusky purple, with the reddish lines marked by round blackish spots. There were also numerous ones on the cheeks and sides, as well as a few beneath the under jaw. The gill-covers, no less than the spots on the forepart of the body, were richly gilt. Palermo, February 12th, 1835."

CEPHALEPIS octomaculatus.

Anterior dorsal fin with three rays, the hinder one greatly prolonged and spatulate; caudal fin very long, of six rays, with the membrane extending almost to their tips.

This extraordinary fish, named by Professor Rafinesque from the specimen I discovered in Sicily in 1810, requires a more detailed account than what he has given of it.* Its general form and proportions are very similar to that of *Trachipterus Spinolæ* (Cuv. pl. 296.); but the tail or caudal fin is not in the least vertical, nor are there any spines at its base.

The first dorsal fin is of three rays; the first not being half so long as the second, and the third double the length of the intermediate ray. They are all connected by a slight membrane; but the third ray is prolonged into a filament half as long as the body, and terminates in a spatulate appendage. The ventral fins are remarkably long and pointed, the rays rapidly diminishing in length beyond the first, and extending beyond the membrane; those of the caudal fin are the same, and very little longer than the ventral rays; the pectoral is very small and rounded. There are three black spots at equal distances along the back, as in *Tr. spinolæ*, and also a fourth near the belly, between the two first of the upper spots. The second dorsal fin extends the whole length of the back, and is of a paler red than the caudal and ventral fins. The whole of the head and body are richly silvered, without scales, but with a central straight line of small raised tubercles, extending from the eye to the base of the tail. Two or three specimens cast up on the shores of Messina in 1810, after a violent storm, are the only examples I have either seen or heard of; nor has the species, so far as I am aware, been described by any more modern writer.

CEPHALEPIS Swainsonii. Raf.

Anterior dorsal fin of a single long spatulate ray; caudal fin of seven long rays, connected only by a basal membrane.

An accurate pencil drawing, made from a fresh specimen, is the only authority I can now produce for this singular fish, which was communicated to my friend Rafinesque, and described by him in one of the Sicilian periodicals not now in my possession.

Its shape, spots, colour, and whole aspect, was so much like the last, that if it had not been, as the drawing evinces, in an uninjured state, I should have taken it for the same species. injured by having the two first dorsal rays broken off. The additional ray, however, to the caudal fin which this possesses, militates so much against such a supposition, that it is here inserted as distinct. The ventral fins in both have seven rays; but in this the anterior dorsal ray is unaccompanied by any smaller ones before it, and the membrane of the caudal extends only to one-fifth the length of the rays. One or two specimens were found cast upon the Messina coast in 1811. Total length 8 inches.

* Indice d'Ittiologia Siciliana, p. 55.

PLATYSOMUS, Sw. (*Vomer*. Cuv.)

It will appear from the descriptions we shall now lay before the ichthyologist, that at least three species have been overlooked by Cuvier and other authors, under the general name of *Vomer Brownii*. The name of this sub-genus having been already changed for that of *Platysomus* in the body of the work, and its distinctions defined, the species in question will be now enumerated.

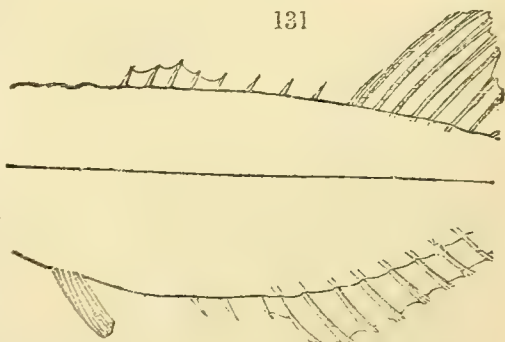
PLATYSOMUS *Brownii* (fig. 131.)

First dorsal fin minute, of five short connected spines and three detached ones behind; anal fin with two detached spines before, and one connected to the fin.

Vomer Brownii. Cuv. et Valen. pl. 256.

This is the species described in some detail, in the general work above quoted, the authors of which merely observe that it "is subject to some variation in its proportional breadth, but without affording either well marked or constant characters, by which specific distinctions might be drawn." All this may be true, and yet there can be no question that, deceived by a general or superficial resemblance, our learned authors have overlooked several others, differing not merely in these particulars, but in those very characters which they themselves have proposed for the species. The simple fact, indeed, of this species being alleged to inhabit the whole range of the varied temperature of America, from New York to Brazil, as well as other localities in the Atlantic and Pacific Oceans, might well have excited suspicion that they were not, in all probability, the same.

The annexed outlines of the first dorsal fin, and the corresponding portion of the ventral profile (brought near together merely to save space, and to show the relative positions of the spines, &c.), will materially assist our description of these parts. The first dorsal is minute, and composed of five spines connected by a membrane, the second and third of which are the longest, while the first and the last are shortest: behind these, there are three other spines without any membrane; and a fourth, about twice as long, forms the anterior ray of the second dorsal. Between the ventral fin and the anal are two short detached spines; and a third, of nearly



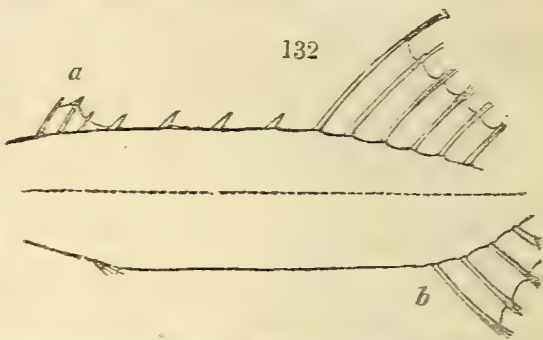
equal size, forms the first ray of the anal fin, and is connected by a membrane to the second ray. The ventral fin in all the three species is very small; but in this it is, comparatively, the largest. MM. Cuvier and Valenciennes do not mention the particular locality from whence the specimen here described from their figure was received. Equally impossible is it to determine, whether this is really the species figured by Brown, the natural historian of Jamaica, after whom it has been named.

PLATYSOMUS *Spixii*.

First dorsal fin minute, triangular, of three connected rays, the two first considerably longest; four detached spines behind, but none in front of the anal.

Vomer *Brownii*. Spix and Agass. Braz. Fishes, pl. 57.

The second species I know only from the figure and description of Spix. The first dorsal fin (fig. 132 *a*.) is represented of a triangular shape and of three or perhaps four rays, following which are four strong spines, but without any membrane. The first ray of the second dorsal fin is not, as in our *Brownii*, preceded by a spine, but is longer than any of the others; while there are no spines either detached from, or connected to, the anal fin. The shape of the body altogether is shorter and broader; the ventral fin *b* is much smaller, and placed behind, not beneath, the first dorsal fin. The annexed outlines of both contours will also show that the commencement of the anal fin is considerably behind that of the second dorsal; whereas, in *Brownii*, it is a little in advance.

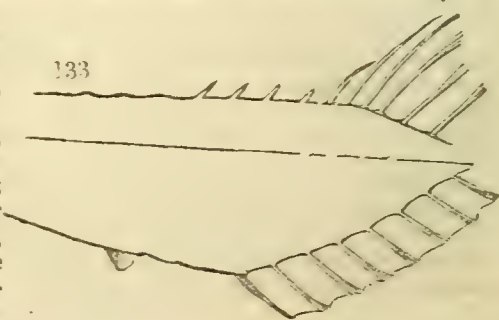


PLATYSOMUS *Micropteryx* (fig. 133.)

First dorsal fin entirely wanting, but the back armed with four isolated spines; ventral fin hardly perceptible; anal spines entirely wanting.

This third species, which I have named from the extreme smallness of the ventral fin, which nevertheless seemed to have been injured, is not uncommon at Pernambuco, where the following description, and also a drawing, was executed from fresh specimens.

Body remarkably thin, destitute of visible scales, and entirely silvered; but the back has a bluish tinge, and the sides reflect pale shades of golden and pink; all the fins are pale dusky, except the anal, which is yellowish. Irides yellow; margin of the head, back, and belly sharp; the latter seems formed by a strong bone, but there are no external spines or internal tubercles; tongue thin, moderate, and truncated at the tip; eyes moderate; jaws capable of extension, rough with minute and imperceptible teeth,



incurved to the touch; gill aperture large, the membrane of seven rays; vent nearest the head, and placed beneath the base of the pectoral fins; back with four long tubercles beneath the skin, commencing above the eye, and followed by four movable recumbent, short spines, all placed before the dorsal fin; dorsal fin commencing nearest the tail, between the ventral and anal fins, pointed or slightly falcate at the forepart, and very narrow behind—it reaches to the base of the tail—the first ray short and spinous, the rest forked, the third ray the longest; pectoral fin long, greatly falcated, and reaching much beyond the vent; ventral fin rather before the pectoral, very minute, having six branched crisped rays, placed immediately before the vent; anal commencing rather before the dorsal, of the same shape, and terminating in a line with it: the first ray spinous, the rest branched; caudal deeply forked. Lateral line as in *P. Brownii*; length from one to two feet.

ARGYRIOSUS *Setifer*.

The first dorsal fin with four connected rays, the first and fourth very short, the second and third the longest; and two free spines placed before the anal fin.

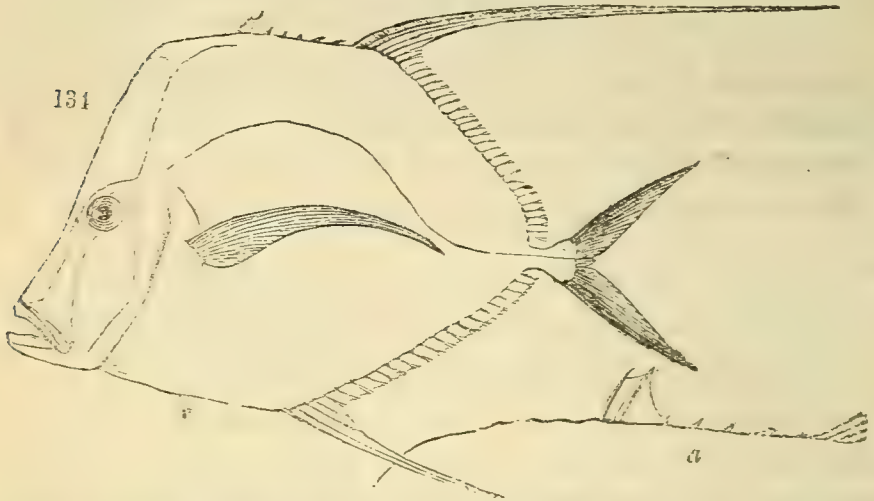
Argyreiosus Vomer. Cuv. et Valenc. pl. 255.

We are again obliged to advert to the partial and often the superficial examination with which nearly allied species have too often been regarded by the authors of the *Hist. Nat. des Poissons*; an imperfection which we can only account for by nearly all their descriptions having been made from preserved specimens; and by supposing that these eminent writers, not unfrequently, have been absolutely overwhelmed with their materials. However this may be, we have no doubt that the opinion they express, of there being but one species of their sub-genus *Argyriosus*, is equally erroneous with that which regards the genus *Cepola* and the *Platysomus Brownii*. I can only describe one of the present group from personal knowledge; but if the figure given in Spix's Brazilian Fishes is correct, it is, notwithstanding it has been called the *A. vomer*, a third species. The fragile nature of the filaments on the first dorsal, and of the articulated rays to the ventral fins, renders any distinctions drawn from these parts very objectionable; but the sharp spiny prickles and hard rays of the dorsal fin and back are always permanent, and I believe remarkably constant in their relative size and number.

Not having seen the species, which I shall now distinguish by the specific name of *Setifer* rather than that of *vomer* (a term altogether objectionable), it will be useless to repeat Cuvier's description, except in reference to the first dorsal fin and the detached spines. Of the first he observes, that it has eight rays, four of which are free, and assume the appearance of spines. Of the four others which are in front, and connected by a membrane, the first and the last are very short; the second remarkably long and terminated in a filament, while the third is about three times the length (according to his figure), of the very short spines which follow it. He also says that there are, between the anal aperture and the anal fin, two fine and slender spines. We leave out some minor distinctions, such as the

great length of the ventral fins, the shortness of the second dorsal, when compared with the next; all which, however, collectively show, how truly distinct this species is from the following.

ARGYRIOSUS *Mauriceii*.



First dorsal fin of three short rays, the third being a minute spine, the first and second the longest. No free spines before the anal fin.

Dorsal, 3, 2, 24; pectoral 20; ventral ab. 12; anal. 1, 19; caudal ab. 25.

Inhabits the coast of Brazil.

The foregoing outline (*fig.* 134.), reduced from a drawing made from the fish just dead, may be compared with the figure of Cuvier referred to in the preceding description: the outline at the bottom (*a*) is of the back and first dorsal fin upon a larger scale. The ventral fin as is almost always the case, from its extreme fragility, was broken. Independent of the leading peculiarity of this new species, the great elongation of the second dorsal fin in front is not the least remarkable. I have named it in honor of the peerless Prince Maurice of Nassau, the patron and friend of Maregrave, and himself one of the most distinguished naturalists of the age which he adorned.

In the body, jaws, tongue, teeth, gills and nostrils, this species perfectly resembles *Platysomus*: the pectoral fins are longer in proportion; very much falcated, and reach to within a short distance of the end of the body. Dorsal fins two, the first very small, triangular, and placed rather behind the pectoral; it is of three rays, the two first bony, simple, and ending in a short filament; the connecting membrane extends to the last ray, which in a short spine; beyond this are four minute unconnected spines, the last terminates at the base of the second dorsal: on the hind part of the head are three covered tubercles. Second dorsal fin with the first ray so remarkably long as to reach far beyond the tips of

the caudal ; towards its base it is broad, compressed, long and articulated : the three following rays are considerably shorter, anal fin is not quite half as long (in its front rays) as the second dorsal, and commencing beneath the fourth dorsal spine; ventral fin rather before the pectoral, the rays about twelve, very fragile, and all broken. The number of rays were as follows :—

ARGYRIOSUS *triacanthus*.

First dorsal fin small, triangular, of three connected rays behind which are three naked spines ; anterior rays of the second dorsal, and of the anal fins of equal length, the latter commencing opposite the first dorsal.

Argyriosus Vomer. Spix and Agass. Fishes of Brazil, pl. 58.

Under the above provisional name I shall here designate what is certainly a third species of this little group, if the figure given in the beautiful work of MM. Spix and Agassez is not most glaringly inaccurate, a supposition and a censure which there is no ground for entertaining. I omit, however, all mention of the ventral fin, for the reasons already stated, in the specified character, although it may be as well to mention in this place, that it is represented as very short and falcate ; the first, or lowest ray, being a little more than one third the length of the pectoral fin.

The first dorsal fin has three rays, but possesses this great peculiarity, that the first ray is the longest, the two others rapidly decreasing, so as to render the fin perfectly triangular : then follow three other naked spines before the second dorsal ; thus making the total number of rays, anterior to this latter fin, six, instead of eight, as in the fish described by Cuvier. The long anterior rays of the second dorsal and of the anal fins are of equal length ; but from the very forward position of the latter, they do not terminate equally, that of the dorsal comes almost in a line with the end of the caudal, but the long ray of the anal fin only reaches to just beyond the base of the tail : the anal fin is so near the head as to commence on a line with the first ray of the anterior dorsal ; a structure alone which will distinguish this from the two preceding species. Finally, it may be observed, that the general outline of the body is more angulated ; the broadest part is just above the eye, from whence the contour makes a gradual slope. The profile also of the belly is more angular ; sloping downwards from the mouth to the base of the anal fin, and then upwards to the base of the tail : there is a short spine connected to the base of the anal fin, but none is mentioned at the corresponding dorsal.

SCOMBER *undulatus*.

Sides of the back marked by undulated angulated bands, with shorter lines in the interstices ; sides of the body unspotted ; dorsal finlets six, the two last longest, and approximating ; first dorsal of nine rays, the last

minute ; a short spine before the anal fin, which is placed immediately beneath the second dorsal.

Scombro. Rondel. p. 235.?

Inhabits the coasts of Sicily.

First dorsal 9 ; second dorsal 12 ; finlets 6 ; length of the specimen examined nearly 1 foot. Differs from the *Scomber maculatus* of Couch* in having an obtuse rounded plate above the operculum and pectoral fin, and in being entirely unspotted on the sides of the body and belly. On the other hand, it differs from the *Scomber colias* of Cuvier† in having six instead of five spurious fins‡, while the ventral fin is exactly under the second dorsal, not, as in *Colias*, half-way behind it. The two last rays of the anterior dorsal are partly hid in a groove ; the lower jaw is very slightly longer than the upper ; and all the scales are very minute.

SCOMBER *gracilis*.

Body not much broader than the head ; anal fin placed half-way behind the second dorsal ; finlets six above and below, the two last approximating, and with two others on each side the base of the caudal fin.

Inhabits the coasts of Sicily.

First dorsal 9 ; the last remote and minute and nearly hid ; the three first approximating ; second dorsal 12 ; anal 12 ; the first minute ; vent opposite the middle of the second dorsal. On *each* side of the termination of the tail are two finlets, one under the other, placed horizontally in the same situation as the carinated processes occupy in certain other fish ; sides of the back marked with simply angular bands pointing towards the tail ; the sides silvery and unspotted ; all the scales minute ; the bony plate above the operculum is obtuse, and is nearer to the top of the head than to the pectoral fin. The *S. macrophthalmus* of Rafinesque is closely allied to this, which has the eyes also very large, but it differs in wanting the supplementary finlets on the sides of the tail, and in not having the same number of finlets on the upper and under margin. The three first rays in the dorsal and anal fins are close together, and the space between the others is gradually widened as they recede from the head.

* Loudon's Magazine of N. H. pl. 22. fig. 8. " Spurious fins six above and below ;" but the figure only represents five.

† This is clearly not the *Colia* of Rondeletius. See his description and figure, p. 235.

‡ No mention is made of these fins by Cuvier, but the figure represents only five.

In speaking of his *S. colias*, M. Cuvier observes, "there is no doubt that it is the same as the *Scomber macrophthalmus* of Rafinesque; all the characters accord, excepting that the author finds six false fins above, an error which he might have easily fallen into by the separation of the last ray of the second dorsal, or by counting the last ray as two." I can see no ground for this supposition, which would not, perhaps, have been entertained if M. Cuvier had seen any *Scombri* with six false fins: two of these we now characterise; Rafinesque's is probably a third, Mr. Couch's *maculatus* a fourth, and there are sufficient grounds for believing that others exist, that have been erroneously placed by M. Cuvier under his *S. colias*, which latter species, moreover, we do not agree with him in considering the same as the *Colia* of Rondeletius.

NAUCRATES *ductor* Cuv.

Dorsal spines three; anal two; lower jaw longer than the upper; body and posterior fins with transverse blackish bands; "irides golden."

Naucrates Fanfarus. Raff. Caratt. p. 41.

Naucratis ductor. Cuv. et Val. H. N. des Poissons, viii. 312. pl. 232.

Inhabits the coasts of Sicily and the Mediterranean.

"This," observes professor Rafinesque, "like the *N. ductor* of authors, has the body transversely banded with blackish, but this latter is very distinct from having four distinct spined rays, the jaws of equal length, and the lateral line straighter: both have the same habits; but *N. fanfarus*, instead of inhabiting the Ocean, is found in the Mediterranean, where it is common. Nor is it restricted to the shores of Sicily, for I have reason to believe it is found from the coasts of Spain to those of the Levant. In Sicily it is called the *fanfaro*; it is abundant in autumn, and usually measures about a foot in length; the irides are golden."

Upon the above description, a close translation of the original Italian, M. Cuvier makes the following remark. The *Naucrates ductor* Cuv. "is also the *Naucrate fanfaro* of M. Rafinesque. If that naturalist thought that his *fanfaro* differed from the common pilot, it was because he only judged of the latter from bad figures."

It will be seen, however, from the following description, that M. Rafinesque was perfectly aware of the existence of a second species of *Naucrates* in the Mediterranean, which M. Cuvier was not, and has consequently confounded with the above. On the part of M. Rafinesque there does not appear any error; he retained the original name of *ductor* to one species, and to the other he gave that of *fanfarus*. Had this latter name not been a provincial one, we should have felt bound to have adopted it, not merely on the score of priority, but because it would be only rendering common although tardy justice to the accuracy of his discrimination,—at least in this instance. But as the case now stands, and M. Cuvier's name has been generally adopted, we think it had better, perhaps, be retained; although it may probably lead to error if the distinctions here pointed out between these two species are not kept in view.

NAUCRATES *cyanophrys*.

Dorsal spines four, the first and the last very small ; anal spines two ; jaws equal ; body, but not the fins, with blackish bands ; irides blue ; tongue without teeth.

N. ductor? Cuv. et Val. *Centronotus conductor*. Risso, p. 193.

Dorsal 4, 26. ; pectoral 18 ; ventral 1, 5 ; anal 1, 17 ; caudal 24 ; gill membrane 6.

Inhabits the coasts of Sicily, particularly Palermo (Nob.), and of Nice (Risso).

“ The usual length of *N. cyanophrys* is above 1 foot ; its form, in comparison to *M. Cuvier*’s figure (plate 232.) of *N. ductor*, is nearly the same ; but the eyes are much smaller, the mouth less wide, and the two jaws are of equal length ; the first dorsal spine commences in a line with the tip of the pectoral fin, and not, as in *ductor*, with the third part of its termination. The first and the last spines are minute, and only half as long as the two middle, which are equal ; and the distance between each is the same. The bands on the body do not extend, as in *ductor*, to the dorsal, caudal, and anal fins, the first and last of which are entirely blackish ; the anal is lighter. The scales are very minute, not larger than the circumference of the head of a good-sized pin. The skin is tough ; teeth in the jaws rather small, sharp, and much crowded ; those in the upper jaw longest. The pre-operculum is scaled only round the eyes ; the sides and belly white ; pectoral fin nearly black, darkest inside ; ventral fins reposing in a groove, and larger than the pectoral ; their outer surface white, but black between the two outer rays inside ; vent rather nearest to the caudal fin, at the base of which, above and below, in a conspicuous depression. — *Palermo*, February 15, 1815.”

N.B. This latter character is not mentioned by Cuvier as belonging to his *ductor*.

It is obvious from what *M. Rafinesque* has said on the last species, that he considered this as the true *ductor* of authors, and it is more than probable that Cuvier possessed this species (either dried or in spirits), since he framed his description of his *ductor* from specimens sent to him from Marseilles, Genoa, and Naples ; and those which he alludes to as having, although rarely, *four* spines, instead of the ordinary number of *three*, were probably specimens of our *N. cyanophrys*. On the other hand, *M. Cuvier* assigns to all those he examined two other characters, not found in this ; namely, that of having the under jaw longest, and the irides golden ; whereas, in this, the jaws are equal, and the irides blue. Having so drawn up the specific characters of these two species as to place their peculiarities

in immediate contrast, I have merely stated such others, mostly of a comparative nature, as will still further distinguish them.

NAUCRATES *serratus*.

Dorsal spines four, the two first shortest ; sides of the tail carinated and serrated ; irides yellow ; tongue armed with teeth.

Scomber ductor. Bloch, Ichth. pl. 338.

Described by Bloch, who expressly mentions that the carinated process on each side the tail is serrated *, and that the tongue is toothed its whole length ; that the jaws are equal, and that the dorsal spines are four ; the figure represents the two first as smaller than the two last ; the body has four bands only, the first of which is just before the dorsal spines, and the last at the tip of the tail ; the caudal fin has a black band in the middle of each of its lobes. Bloch does not specify the locality from which his specimen was procured ; the rays are stated as follows : Dorsal 4, 24 ; pectoral 15 ; ventral 1, 6 ; anal 1, 16 ; caudal 18.

TRACHURUS *siculus*.

Lateral line passing through the middle of the abdominal plates ; anal fin shorter than the second dorsal, and preceded by two approximating unconnected spines ; first dorsal of nine rays, the last very minute, and close to the second dorsal.

Dorsal 8, 34 ; pectoral 20 ; ventral $\frac{1}{2}$; anal 28 ; caudal 18 ; br. mem. 7.

Shores of Palermo. (January 20. 1815.)

Length not quite nine inches ; the colour above dark blue ; the sides and belly silvery, with shades of yellow, orange, pink, and blue, and a black spot on the operculum ; eyes large ; irides silvery gold, with shades of red ; nostrils vertical ; lower jaw longest ; the first dorsal placed in a groove, and terminated by a minute ray, close to, but not connected with the second dorsal ; pectoral long, pointed, ending in a line with the commencement of the second dorsal ; vent central, followed by two spines close together but without a membrane ; hinder portion of the abdominal plates carinated into spines, which increase towards the caudal fin ; scales not discernible. To this sub-genus, proposed in 1810 by professor Rafinesque, must be added three other species inhabiting the Sicilian seas, described in his *Nuovi Generi*, &c. p. 43.

MUGIL *squamopennis*.

Snout projecting beyond the mouth, the three posterior

* “ En forme de Scie,” tom. vi. p. 32.

fins entirely covered with small scales ; ventral fin with a basal scale ; pectoral as long as the head.

Dorsal 4, 1, 9 ; anal 2, 9 ; pectoral 18 ; ventral 6.

Inhabits the Ganges.

The descriptions of the Indian mullets in the *Hist. Nat. des Poissons*, are not sufficiently precise to enable me to determine whether this is among them. I have therefore considered it a new species, remarkable for the second dorsal, the anal, and the caudal fins being thickly, and almost entirely, covered with very small scales. The shape is fuciform, and very like that of Hamilton's *M. corsula*, from which it differs, at first sight, by possessing a long lance-shaped scale at the base of the ventral fins : the pectoral fins are quite as long as the head, but in *corsula* they are shorter ; and nothing is said regarding the latter having the posterior fins covered with scales. In ours ; again, the ventral fin is so much in advance of the second dorsal, that the hinder base of the former is in a line with the middle of the latter. There are differences likewise in the number of the fin rays. In the present species I counted ten rays in the second dorsal, of which one was spinous, two simple, and seven branched : the anal fin had eleven ; viz. two spinous, two simple, and seven branched. The specimen measured about $7\frac{1}{2}$ inches long, and was brought from the Ganges by my friend E. Cotton, surgeon of the 14th regiment of foot.

BATRACHUS *rubigenis*.

Yellowish brown, marbled with blackish brown on the head, body, and fins ; a reddish spot on the cheeks ; two palmated cirri over the eyes, and numerous others on the head and lateral line ; operculum with three prickles on each side.

Inhabits the shores of Pernambuco, Brazil. Length $4\frac{1}{2}$ inches,

Body destitute of visible scales, compressed ; head depressed ; eyes small, approximate, and near the snout ; over each is a moderate-sized palmated cirrus, finely ciliated at the margin ; and numerous others, much smaller, are scattered over the head, edges of the operculum, and margin of the lips, these latter being rather larger ; those on the crown are very short, generally in pairs, and arranged longitudinally ; *teeth*, in both jaws, in a single row, small, irregular, unequal, very obtuse, and almost rounded, except at the tip of the lower jaw, where they are sharp and incurved ; *tongue* and *palate* quite smooth ; the former is short, bony, and connected as far as the tip ; *mouth* wide ; lips and cheeks fleshy ; lower jaw longest ; nostrils very small, nearest the eyes ; head, operculum, and all the fins enveloped by the common skin of the body, and this renders the fins so thick, that it is impossible to count their rays. The hinder plate of the *gill-covers* is small, being armed with three sharp and rather strong spines, which are in a manner concealed, being almost covered with the common skin ; lateral line commencing at the hind part of the crown, and continued, in a waved line, near the back, to the caudal : it is composed of white dots, which are each furnished with minute cirri ; *dorsal fin* single, of nearly equal breadth throughout, commencing behind the pectoral, and ending close to the caudal ; *ventrals* thick, short, pointed, of two rays ; *anal* behind the dorsal, but ending with it, and of nearly equal breadth ; *caudal* small, rounded ; *pectorals* rounded, reaching to the vent, which is central. In colour, the whole fish is marbled with brownish black, in transverse clouds,

on a yellowish brown ground ; head and fins the same, the latter with yellowish lines ; belly dirty white, having on each side a row of white dots, corresponding with the lateral line ; head beneath white, freckled with brown. — 11 Feb., 1817.

DACTYLOPTERUS *occidentalis*.

Dorsal fins two, approximate ; the first of four connected rays ; the second of eight, of which the seventh is alone forked ; anal fin of six simple rays.

Inhabits the West Indian seas, St. Vincent. L. Guilding.

Total length of the specimen, 6 inches.

The general characters of this species are much the same as that found in the Mediterranean, and described by Cuvier and Valenciennes ; it differs, however, in the structure of the dorsal rays, having one less in the first dorsal fin, and only the seventh (instead of the sixth and seventh) ray of the second fin forked. All the anal rays are simple, whereas, in the Mediterranean species (according to Cuvier), the fifth is forked. Cuvier has reckoned the two detached rays placed before the commencement of the first dorsal fin as part of that fin ; but this seems to be an improper view of the subject, for these rays are totally distinct from the true dorsal fin, to which they are not united, even at their base, by any vestige of a membrane ; they are, in fact, filiform appendages, perfectly analogous to those before the pectoral fin ; they are soft, very flexible, and fringed with a delicate narrow membrane, which unites them only at their base ; the tip of the pectoral fin, which just reaches the base of the lateral caudal rays, is exactly three fifths the length of the entire fish ; but in the *D. volitans*, Cuvier says, the proportion of this fin is that of two thirds the entire length. I regret not having a specimen of the Mediterranean species to compare with this ; for however common it may be in certain localities, I never met with it on the Sicilian or Maltese coasts. The vent is not, as in *D. volitans*, "précisément un milieu de tout le poisson," but is half an inch nearer to the snout than to the tip of the tail. There is a peculiarity in the pectoral fins in this fish which deserves notice : instead of being inserted in such a way as to be open vertically, and parallel with the sides of the body, as in ordinary fishes, they are so placed as to open horizontally, so that the *upper* surface corresponds with that which would be the *inner* in ordinary fishes, and neither of the surfaces can be brought into contact with the sides of the body. Now this remarkable structure, which seems to have been hitherto overlooked, is doubtless intended to prevent the delicate membrane which unites the pectoral rays from coming into contact with the rough scales of the body ; for these scales are so prickly that they would very soon tear and destroy the pectoral membrane, if the fin was placed in the ordinary direction.

Having only seen a preserved specimen of this species, it will be impossible to describe the natural colours. The back appears dark olive, marbled transversely with darker shades ; these shades are more distinct, and assume the form of bands across the head ; the broadest band is between the eyes ; and, behind this, there are five others, gradually diminishing in size, the last being just before the tip of the surscapular spines.

DACTYLOPTERUS *Blochii*.

First dorsal fin of six connected rays ; anal fin of eleven rays ; dorsal fins very wide apart.

Trigla volitans. Bloch, pl. 351.

Bloch, when describing his *T. volitans*, observes that the

rays of *all* the fins, except those of the caudal, are simple. However this may be, the species he describes is at once distinguished from the last, as well as from the *volitans* of Cuvier, by the above strong specific differences.

In other respects, it seems to have all the genuine characters of form, &c., belonging to both, as well as, in a less degree, to the Indian species. If Bloch's figure is correct, the back, adjoining the base of the dorsal fins, is marked by a row of prickles, similar to those usually seen in the genus *Trigla*; but this, and the structure of the rays above alluded to, is of minor importance. Bloch does not mention the precise locality from whence he received the specimen he has figured; but in its colouring, there is no appearance of those bands on the head of *D. occidentalis*, or of those marbled markings mentioned by Cuvier as being on the *volitans*. It is somewhat singular that MM. Cuvier and Valenciennes have taken no notice of Bloch's *volitans*, although they allude to two others of Klein (Miss. 4. pl. 14. figs. 1. and 2.), the first of which they consider as drawn from "un individu ramolli de l'espèce commune*," and the second as "qui ne présentait qu'un jeune dactyloptère commun desséché." To neither of these opinions can I subscribe; for although the figures and descriptions are very imperfect, there seems to me sufficiently strong indications, given in both, to justify us in considering them distinct from the two preceding, as well as from the two known to M. Cuvier. I shall, therefore, now state what appears to be their specific characters.

DACTYLOPTERUS *tentaculatus*.

Pectoral fins reaching only to the end of the dorsal; head with three membranaceous appendages, two behind the eye, and one on the throat.†

Cataphractus, No. 10. Klein, Miss. p. 44. pl. 14. f. 1.

Scales on the sides of the belly and tail prominent and serrated; hinder (?) dorsal fin with eight strong rays. In the figure the anal fin is placed much nearer the caudal than is the second dorsal; and it is clear that the pectoral fin is naturally short, because the artist has very accurately represented the peculiar curled appearance which the tips of this fin exhibit when in a dried state.

DACTYLOPTERUS *fasciatus*.

Pectoral fins short, about half the total length of the fish; scales granulated.

Corystion, 1. Klein, Miss. 4. p. 45. pl. 14. f. 2.

Of this fish Klein merely says, that it is like the last, but the body is granulated, and both that and the tail variegated with oblique bands: the

* Klein's words are these:—"Appendices tres habet, membranaceas, quarum binæ pone oculos, tertia agula dependet."

† It is probable that Klein has overlooked the first dorsal fin, which, in this genus, is sunk in a groove; this latter, however, is expressed in the figure.

figure represents three of these on the body, and three transverse ones on the tail.

DACTYLOPTERUS *Trigloïdes*.

Pectoral fin short, reaching only to the end of the second dorsal, with three unconnected digitated processes at the base, as in *Trigla*.

Trigla corvus. Raf. Carat. pl. 6. f. 1. p. 32.

The very slight notice of this most interesting species by Rafinesque prevents me from giving further details than what may be learned from his work. He expressly says that there are three free rays at the base of the pectoral; while, in every other respect, his figure portrays a genuine *Dactylopterus*. The first dorsal fin is represented with four rays, the second with nine; the anal fin is immediately under the second dorsal, and neither is surpassed in its length by the pectoral. Rafinesque observes that the back and pectoral fins are black with blue marks, the sides reddish; and the belly white.

Imperfect as are the notices of the three last fish, I have no doubt that future discoveries will establish their authenticity, and even increase the present list. Another, indeed, which differs from all these, is incidentally noticed by Bloch, who says that a second specimen of his *Trigla volitans* had only a single free ray before the first dorsal; that this ray was much lengthened, and placed considerably nearer the head. This is probably a new species between *Blochii* and *orientalis* (Cuv. pl. 76.), this latter being distinguished by an intermediate spiny ray between the long filament and the first dorsal. Enough, however, has now been said to show that there is every probability that the *D. volitans* of all preceding authors includes many species, and that the majority of the *specific* characters they have assigned to it are more properly *generic*; the species themselves being determined by the number and construction of the rays, the relative length and position of the fins, &c. By these characters, also, we may readily distinguish the two following, which have been also overlooked as one by MM Cuvier and Valenciennes, under the common name of *D. orientalis*. I shall, therefore, first state the true characters of their species, and then describe the others.

DACTYLOPTERUS *orientalis*. Cuv. Val.

Suborbital bone without spines; pectorals nearly reaching to the end of the caudal fin; two soft detached rays, wide apart, before the anterior dorsal fin, the first very long, the second short, and both furnished with a membrane at the base; anal rays — ?

D. orientalis Cuv. et Val. N. H. Poissons, iv. p. 134. pl. 76.

DACTYLOPTERUS *bispinosus*.

A slender ray, and an oval spine, wide apart, placed before the anterior dorsal, and another oval spine before the second dorsal; anal rays branched.

Trigla volitans. Russell, ii. p. 45. pl. 161.

Dorsal 5, 8; anal 6.

Coasts of Coromandel; but rare. Dr. Russell.

The second isolated process, which in the last is a short ray provided with a basal membrane, assumes in this species the form of an "oval prickle pointing backwards;" while "another similar prickle" is placed between the two dorsal fins. This spine or prickle exists also in *D. Chinensis*, but does not appear either in the figure or description of M. Cuvier's *orientalis*. Dr. Russell¹ observes, that the anal fin is opposite to the second dorsal, and has six "*ramose*" rays; but whether these rays are also branched in the *orientalis* does not appear from the description; the first, or soft dorsal ray, which in the last is very long, is in this only about an inch in length. The colour is dark red, with some round spots of dusky green; the sides lighter red, and the belly white; the dorsal, pectoral, and caudal fins have also dark green spots. The usual length is about 11 inches.

DACTYLOPTERUS *Chinensis*.

Pectoral fins shorter than the base of the caudal; sub-orbital bone with the inferior margin crenated, with six stronger spines at the end; sides of the tail with two crenated ridges more prominent than the others; anal rays simple.*

I ground my belief that this is a distinct species from the *orientalis* of Cuvier, on account of his having expressly stated that his fish has "Le bord inférieur de son sous-orbitaire n'a pas de dents en scie;" and that "there is only one series of carinated scales, more elevated than the others, on the sides of the tail." Neither of these peculiarities, as will be seen by the above specific character, belong to a specimen now before me, which was in a box of Chinese dried fishes and crabs. I do not lay so much stress upon the much shorter length of the first detached ray of the dorsal and of the pectoral fins in this, than in the *orientalis* of Cuvier, because, although I believe the latter, in my specimen, is quite perfect, and the first is but very slightly broken, yet these minor differences will require further verification; but, on the structure of the sub-orbital bone, and of the two carinated ridges on *each side* the tail, there can be no mistake; for it is impossible to suppose MM. Cuvier and Valenciennes to be in error on two such plain matters of fact. The inter-dorsal spine, or that between the two dorsal fins, which seems common to the greater number of this genus, is very strong in this, but is neither seen in their figure (pl. 76.), or mentioned in the description of *orientalis*. In the number of the rays in the dorsal and anal fins the two species agree; those of the ventral, caudal, and pectoral, are always liable to be miscounted in dried specimens.

The situation of the dorsal fins and of the two detached rays before them, are the same in this and in *orientalis*, but there are some minor differences in the relative distances of the rays—presuming that M. Cuvier's figure of *orientalis* is correct, which it may be as well to notice. A groove extends from the top of the head to the inter-dorsal spine, which groove is margined on each side by a line of prickles more developed than those on the sides beneath. The first detached dorsal ray, when depressed, reaches only to the base of the first dorsal fin; and the second detached ray is so short, that the spinous part does not reach so far as the last; but it is clear that both these rays end in soft filaments, besides being furnished with a short membrane, which connects each to the back. The first ray of the first dorsal fin is the longest, the two next being nearly of the same length, but the two last are much smaller and considerably wider apart: the last of these appear to be forked, and it reaches just to the base of the inter-dorsal spine: the three last rays of the second dorsal are also forked; but whether the five first are equally so cannot be determined, as they are injured. The

* The penultimate ray, in my specimen, is broken; the rest are simple.

carinated ridges on the sides of the tail are exactly the same as those of *D. occidentalis*. The points of the pectoral fins are perfect, and they only reach to within half an inch of the base of the caudal fin, whereas, in *orientalis*, the tips of these rays extend almost, if not quite, to the end of the caudal rays. The colours of the skin of course had faded, but there was no appearance on the head or body either of bands or spots; the sides and belly were silvery; the fins blackish, with pale spots; and the back brown. That this species is not that figured and minutely described by Russell, may be inferred from three circumstances, first, that the bony crown is not, as in that, "divided by engraved lines into compartments of divers forms, but chiefly lozenge," for there are no perceptible divisions at all; secondly, because it has, like *orientalis*, a distinct ray, instead of an "oval formed prickle pointing backwards*," just before the first dorsal fin; and thirdly, because the anal fin has not ramose rays but simple ones. With Dr. Russell's species, however, it agrees in the length of the pectorals, and in the sub-orbital bone having, as in that, "the margin serrated;" a part which, as we have already observed, Cuvier says is smooth in his *orientalis*.

TRIGLA *Swainsonii*. Leach. Swainsonian Gurnard.

Pectorals considerably beyond the base of the anal fin; first dorsal spine smooth; orbits with two spines before and one behind the eye; lower ray of the pectoral partly detached; caudal unequally lunate.

Dorsal 9, 15; pectoral 10; anal 15; vent —? caudal —?

Inhabits the western coasts of Sicily.

Upon sending specimens of this new species to my late regretted friend Dr. Leach, and pointing out its distinctions, he did me the honour of giving it the above name, under which it is still preserved in the British Museum. So far as I can discover, it has been overlooked, both before and since, under the designation of *Trigla Hirundo* of Linnæus, a name hitherto given to all those European Gurnards having very large pectorals.

As it is my intention to enter more into the details of this genus on a future occasion, I shall merely at present state such particulars as I can furnish of the Mediterranean species, together with the distinctions of others, by which, as I conceive, their respective differences may be determined. Of the true *Hirundo* of Linnæus, I know nothing at present: it has been distinctly and repeatedly described as having a spinous lateral line; it therefore seems to me altogether objectionable, to apply this name to other species having this part smooth, under the gratuitous supposition that Artedi, Linnæus, &c. are in error. The *Trigla Hirundo* of Cuvier obviously includes two species at least†, one, that of Bloch's, having short pec-

* See Russell, ii. p. 240.

† There are also incidental notices which refer to others.

torals, the other with these fins much longer; two of which we shall now describe, are on the coasts of Sicily, while a British species, also confounded under the specific name of *Hirundo*, was long ago defined by our celebrated naturalist Montagu, as the *T. lævis*. This latter is the species which makes the nearest approach to *T. Swainsonii*; and having examined several fresh specimens of both, I shall here intimate the specific characters by which our British species may be known.* This will at once distinguish it from its representative in Sicily, which I shall now describe.

The largest sized individual of this species I ever saw in the Sicilian markets, where it is common in the winter, was 1 foot 9 inches long. In its broad and depressed head, and in its general structure, it resembles *lævis*; the snout is slightly two-lobed, the extremities having short serratures; the spines which arm the head are generally small, considering the size of the fish, there are two before the eye, and a smaller one behind; the occipital spines are much smaller than the scapular or pectoral ones; of the two others on the gill-covers, the upper is rather less than that of the scapular, while the lower is minute. The pectoral fin exceeds one-half the length of the trunk, but is exactly one-third the entire length of the fish, from tip to tip; its rays are ten, and doubly forked, the first division being nearly at the base. All these are connected to their extremities, but the last or shortest ray is detached half-way from the others, so that it is partly free, as in several of the *Scorpenidæ*; a peculiarity I have not observed in any other Gurnard. Ventral fins little more than half the length of the pectoral, and terminating in a line with the commencement of the second dorsal. the first ray spinous. Caudal fin slightly and unequally lunate, the upper angle being longer than the under, the rays simple, but showing the forked termination of the lateral line, which is perfectly smooth throughout its entire length; scales very small, soft, and round; the anal row of spines are small and simple.

The anal rays are all simple, excepting the last, which is forked at its base, so as to appear double; those of the second dorsal are forked; the first being rather shorter; the first and the fourth dorsal spines equal; the second rather longer than the third, but not equal to the length of the dorsal.

COLOUR. — The colour of the head and body seems subject to much variation; it is generally pale reddish, with clouded waved lines of bluish grey, but sometimes of as bright a red as the *T. Lyra*†, the sides silvery, and the belly white; all the fins (except the pectorals) were pale reddish; the ventral and anal white, the caudal with a blackish cloud or spot in the middle. The pectoral fins have the last or detached ray perfectly white on both surfaces; the other rays are also whitish outside, which relieves the blackish grey that spreads all over their outer surface, it is more or less deep in different individuals, but has never any tinge of red, as in the *lævis*; the ground colour of their inner surface is dull or cinerious blue, with waved transverse, darker bands, between which there is a tinge of yellowish green; but the whole fin, on this side only, has a narrow well-defined margin of vivid blue, which loses its brilliancy after the fish has been some little time out of water; between the first and third ray there is a tinge of pale reddish yellow.

* *TRIGLA lævis*, Mont. Pectorals reaching to the base of the anal fin; orbits with two spines before the eye, but none behind; lowest ray of the pectoral fin not cleft between the membranes, lateral line smooth; caudal equally lunate. Montagu is the only writer who has not confounded this with the *Hirundo* of Britain.

† At least, specimens in the fish-market, which appeared to be of this species (but not examined), were of this colour.

TRIGLA *bracanthus*. Smooth-eyed Gurnard.

Scales of the lateral line large, smooth, and entire, orbits entirely smooth, and no spine on the preopercule. Nineteen rays on the second dorsal, the last short and simple ; lower lobe of the caudal longest.

Dorsal 8, 19 ; pectoral 10 ; anal 17 ; ventral 6 ; caudal 12.

Inhabits Sicily. Palermo. (19 January, 1815.)

General form of the *T. lucerna* as figured by Cuvier and Valenciennes, but the anal fin is broadest, not narrowest, at its commencement, and the lower lobe of the tail is longest, not equal to the other : the fourth ray is equal to the first, not shorter ; head small, the snout hardly divided, and armed with one acute spine at each of the two angles ; the orbits above and before the eye are quite smooth, but there is a small prickle between the hinder part of the eye and the occipital spine ; the upper angle of the preoperculum has a small spine, rather larger than that behind the eye, and almost equal to that at the base of the pectoral, but there is no spine whatever on the preoperculum ; ventral fins reaching to the vent, and shorter than the pectoral, which reaches to the third ray of the second dorsal ; the first dorsal, as in Cuvier's *lucerna*, but the *third* is much longer than the *first* ray ; all the rays of the second dorsal are forked, excepting the first and last, which are simple ; while the last ray is close to the one preceding, and not more than two thirds its length. The vent is immediately below the first ray of the second anal ; and the commencement of the anal is under the second ray ; the anal rays are all forked the last so deeply as to appear double ; dorsal spines small and simple ; the lateral line is marked by a series of large, smooth, imbricate scales not emarginated at their edges, or with any radiated striæ ; the first dorsal ray not serrated.

COLOUR. — From life ; irides silvery ; inside of the gills orange red ; upper parts of the body reddish, clouded with grey ; pectoral appendages, with the dorsal and caudal fins, pale reddish, with darker clouds ; ventral and anal fins white ; sides of the body with a silvery stripe ; belly and under parts white ; pectoral fins externally pale red, but brown at the base between the rays, which are themselves pale ; inner surface, or that next the body, brownish black ; the rays the same, the margin of the membrane edged with blue, but the tips of the rays white.

Whether this is the *filaris* of Otto, considered by Cuvier as identical with his *lucerna*, I have no means of judging. His words I have here quoted* ; but with regard to the *Orghe* of Risso, I am totally at a loss to comprehend, for the following reasons, how it could be confounded with the *lucerna*. Risso expressly says that his *Orghe* has the "lateral line formed of little prickles ;" in Cuvier's *lucina* this line is smooth. Risso's species have the pectorals short, while Cuvier's have them so long as to equal (as in ours) one third the total length of the body. Risso further states that the operculum is terminated *par un long aiguillon*, whereas all the spines in Cuvier's *lucerna* are stated to be very small. Risso's fish has the pectorals dark red, with scattered spots of yellow and blue ; but M. Cuvier having only seen a specimen in spirits, of his *lucina*, quotes Risso's description.

* "M. Risso décrit celui dont nous allons parler sous la nom d'*Orghe*, et Brünch, qui le décrit aussi très-bien, se demande si ce n'est pas la *brigotte* ou la *cabotte* de Marseillais. Peut-être est ce en effet la *cabotte* de Du Hamel ; mais qu'éclaircira jamais les confuscons sans nombre de la nomenclature populaire ? A tous ces noms M. Otto vient encore d'en ajouter un. Son *Trigla filaris* n'est bien certainement pas autre chose que l'*Orghe* de M. Risso." Cuv. et Val. iv. p. 74.

Finally, we may state the essential differences between our *bracanthus* and Cuvier's *lucerna*, in the following manner :—

T. lucerna Cuv. iv. p. 72.

L'angle antérieur supérieur de l'orbite sont trois dentelures.

Le pointes du bas de son préopercule celles de son opercule, et de son épaule sont moins aigues et moins saillantes guana.—Rouget.

3 scales at the lateral line; "ont au milieu sur léger sinus ventrant —leur hauteur fait près de quart de celle du corps.

T. bracanthus.

No dentations whatever above or before the orbits, and only one behind.

No prickle whatever on the preopercule.

The scales not sinuated, and only one sixth height of the body.

Dorsal 10, 18; anal not mentioned.

Dorsal 8, 19; anal 17.

Considering how very constant are the number and proportion of the spines in this genus, particularly those of the head, and looking to the above differences, we entertain the belief that they are distinct species, more particularly as the number of the dorsal rays likewise differs. It still remains to be ascertained what are the colours of the pectoral fin in Cuvier's *lucerna*? what the number of its anal rays? and whether these rays, and those of the second dorsal, are simple or branched?

Obs. Regarding this, and one or two other Gurnards here characterised as new, we have to choose one of three opinions: — 1. Either that they are subject to a much greater variation than naturalists are accustomed to attach to the idea of species; or 2, that the existing descriptions we have quoted are inaccurate in an unusual degree; or thirdly, that they are really distinct. Every one, of course, will form his own conclusions on the superior degree of probability which he may attach to one or other of these suppositions. With respect, however, to the *Trigla bracanthus*, I may observe that I attach, with Cuvier, a primary importance to the armature, or spines and prickles, upon the head, &c; and in proof that these do not in the least vary in individuals from different localities, I must remark that the existing descriptions of northern, or British specimens of *T. lyra*, apply most accurately to those of Sicily; and that the same may be said of Cuvier's description of the *T. aspera* of Viviani. We cannot, therefore, reasonably adapt the first supposition, because, the very reverse is applicable to others of the same group.

TRIGLA *leucoptera*. White-finned Gurnard.

The first dorsal spine serrated in front; pectorals externally white, half as long as the trunk; ventral rays forked, lateral line smooth; orbits with 2 prickles before and one behind.

Dorsal 8 or 9; the second 16; anal 15; ventral 6; pectoral 10; caudal —?

Inhabits the western coasts of Sicily, but very rare.

Length 3—5 inches,

The above specific character will at once distinguish this most elegant little species from all its allies. Its form is not so thick, and the head is more lengthened than in the last. The muzzle is cleft, each lobe being serrated with five or six small spines; before the eye there are *two*, and behind is *one* spine; behind this latter, and placed on the upper part of the

gill-covers, are three others, placed in a triangle; two more are lower down on the gills, and a larger one just above the base of the pectorals; lateral line prominent, but quite smooth; pectorals reaching to half the length of the trunk; scales remarkably small, even minute; ventral rays all forked; the first dorsal spine serrated, as in *Pini*; the dorsal row of spines small and simple; caudal so slightly lunated as almost to be even. COLOUR. — Head, back, and sides olivaceous green, variegated throughout with dark spots and freckles; the lower half of the sides reddish silvery; dorsal and caudal fins pale, with a few brown spots; the three digitated processes freckled with brown; ventral fins brown; pectoral fins with the outer surface, when perfect, covered with a dusky white skin; this skin is easily rubbed off, and then the colour of the membrane is seen to be blackish, with darker spots of rich brown; the under surface is the same, except on the lower half, dark blue, or more properly black, with spots of a bright celestial or azure hue, a few of which are also scattered on the upper half. The foregoing description is not so complete as I could have wished, although it seems quite sufficient to separate this elegant species from the others; but I neglected to make a finished drawing, and the specimens in spirits sent to the British and Zoological museums cannot now be found.

TRIGLA *Adriatica*. Auct.

Snout short; profile obtuse; transverse ridges of the body extending to the belly; the dorsal spines, and those on the lateral line, simple; anal fin of 16 rays; caudal lunate; the lower lobe longest; no spines on the snout.

Dorsal 10, 16; pectoral —? ventral —? anal 16; length 1 foot.

Inhabits Sicily.

Head small, the profile short and abrupt; orbital or superciliary plate with from three to four minute spines before the eye; nuchal spines rather longer than those above the pectoral, with a small one at their base behind the eye; angle of the preoperculum pointed, with a very minute spine, scarcely perceptible; upper part of the suboperculum forming two spines, one directed upwards, the other pointing backwards, and covering the base of the large pectoral spine; margin of the *snout* or upper jaw nearly round, and without any distinct prickles; lower jaw hardly shorter than the upper; first *dorsal* fin commencing exactly even with the pectoral, the first ray externally serrated and equal to the third, the second rather longer: second dorsal as high as the fifth spinal ray, slightly narrowing to its extremity: the last ray, like that of the anal, is thickened, but not doubled; *pectoral* fin long, extending as far as the seventh ray of the second dorsal; *ventral* much shorter, and only reaching to the commencement of that fin; *caudal* distinctly lunated obliquely, so that the under lobe is always longer than the upper; *ventral* fin as long as the second dorsal, but placed a little behind it, so as to bring it nearer the tail: the three digitated processes are thicker and longer than in any other species found in the Mediterranean; scales small, round: the transverse ridges, verticellated, extend from the back to the suture of the belly; lateral line marked by a row of small simple spines or prickles.

COLOUR. — Body bright crimson red; darker on the head; the sides pale red and clouded; the belly white; the appendages and base of the pectorals are marked with irregular spots or blotches of black; pectoral fins pale reddish white, elegantly marked with freckled irregular bands of brown; the inner surface is cinereous blue, the rays brighter, and having close to them spots of a cerulean blue; similar spots are round the margin of the fin; while the lower part is pale clouded red. In some specimens

the tips of the ventral fins are dark red, and the digitated appendages are banded with white; the points of the anal rays are white; and the tail is dark, with white cloudy spots; at the base of the first dorsal ray is a black spot.

OBS.—Not being able, at this moment, to consult the original description by Brunnich, of his *Trigla Adriatica*, I must leave it to others to determine whether modern ichthyologists are correct in considering it the same as the *lineata* of Bloch, and of Linnæus. In the mean time, however, the species above described is clearly distinct from the *lineata* of Bloch and of Cuvier, who both agree in assigning to their species a *double* series of spines on the lateral line, and of *tricuspidate* spines on the dorsal series, or that which margins the base of the dorsal fins. Now, both of these series, in the present species, are always composed of simple spines, without any serrature or division whatever. In their species, also, the ventral fin has but 13 distinct rays, whereas, in this, there are invariably 16. This number agrees with what Gmelin (who, no doubt, copies his account from Brunnich) has assigned to the *Adriatica*, which he further designates as having the snout retuse, hardly lobed, and not spinous; all which characters are so applicable to our fish that we have very little doubt of its being the true *Adriatica* of Brunnich, and consequently distinct from the *lineata* of Bloch, Cuvier, and Yarrell, who have considered them the same. It may here be remarked that Bloch's figure of his *lineata* represents the vertical lines or ridges on the abdomen as only extending half-way down the sides, as in *T. pini*; so that, if this is correct, it is clearly a different species from the *lineata* of Cuvier and Yarrell, where these ridges extend from the back to the belly, as in our *Adriatica*.

TRIGLA *Pini*. Bloch.

Transverse ridges of the body extending half-way down the sides; dorsal spines simple, the first serrated; a row of smaller spines on the lateral line; ventral fin shorter than the pectoral; snout lunated, the angles with six minute prickles; orbits with two anterior spines.

Trigla Pini. Bloch, pl. 355.

—— *Cuculus*. Auct.

Dorsal 9, 18, the last double; pectoral 10; ventral 6; anal 17.

Inhabits Sicily.

M. Cuvier and all our modern ichthyologists assuredly have fallen into error by supposing that the *Trigla Pini* of Bloch was identical with the *Trigla Cuculus*, Linn., of our northern seas. A more attentive comparison of Bloch's figure with the Mediterranean fish I shall now describe, has convinced me they are certainly the same. It will also show that the verticillated ridges across the lateral line are not confined, as is generally supposed, to the *T. Cuculus* of authors.

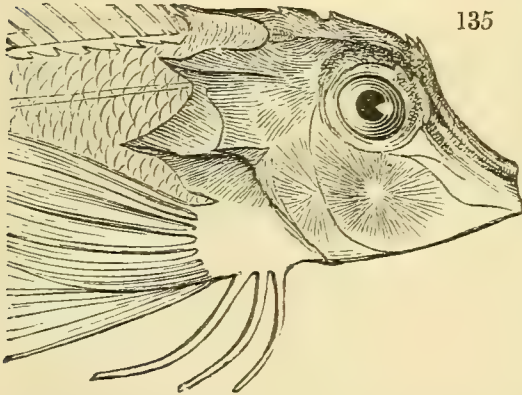
DESCRIPTION. — General size and structure much the same as the *Cuculus*, but the ventral fins, instead of being *longer* than the pectoral, as represented by Mr. Yarrell (i. p. 34.), are manifestly shorter.* The lateral

* M. Cuvier observes of his *Cuculus*, that the ventrals commence immediately beneath the pectoral, and are of the same lengths; a proportion which

line, which in *Cuculus* "is not armed" with spines, is in this indicated by a row of distinct prickles, small and simple. Minor points of variation occur in the structure. In this, for instance, there are seventeen rays in the anal fin instead of sixteen, and I find no notice taken in my original description of the lateral line being furcated at the caudal end. The peculiar characters of the shortness of the ventral, and the spines on the lateral line, are quite apparent in Bloch's figure, which is thus proved to belong to our present species. The muzzle or snout is lunated, with six small unequal spines, directed forwards on each of the two angles. Mr. Yarrell mentions only one small spine on the operculum of his *Cuculus*, whereas this has two, one above the other below, besides the very strong one on the scapular region, just above the pectoral fin: the occipital spines are short, with serrated ridges; caudal slightly lunated, the angles sharp.

COLOURS, taken from the fresh specimens.—Body rich vermilion red, and the sides silvery yellow, the belly white, fins red, but the ventral fin is pink and the anal white; pectoral fin dark brown or blackish, inclining to red in the lower parts; the rays white, the colour inside, or next the body, is the same, but darker; all the rest of the fins are red, irides red, the pupil saphire, the colour of the pectoral fin in the *Cuculus* of France and Britain so very important in this group, is neither noticed by Cuvier or Yarrell. The first anal ray is immediately beneath the second ray of the hinder dorsal, and in my drawing all the rays of these two fins are represented as simple, a peculiarity which is also expressed in Bloch's figure. The *Cuculus* of Cuvier, however, is stated to have all the rays of the second dorsal, except the two first, branched; the anal rays, except the first, are also branched.*

Obs.—M. Cuvier seems to think that there is some variation between the sexes of certain *Trigla* in the lateral line, for he observes of his *Trigla lineata*, that the lateral spines are stronger, and more deeply dentated in the males than in the females.† On the other hand, it does not appear that these fishes alter their appearance when growing, for Mr. Yarrell remarks of his *Cuculus*, or red gurnard, that he has found the characters well marked



in young individuals only an inch and a half long; and this fact, of all their distinguishing characters being developed at that early age, is fully confirmed by my own observations on the Mediterranean species.‡ There seems no good reason, therefore, to suppose that the *Cuculus* of these authors, and the *Pini* of Bloch, are merely sexes of the same; the difference, indeed, in their other characters makes this supposition still more improbable. The annexed cut (fig. 135.) of the head of the true *Pini*, showing the spines,

may be compared with the *Cuculus* of the British coast.§

neither accords with our *T. Pini*, nor the *Cuculus* of Mr. Yarrell and Dr. Parnell.

* Hist. des Poiss., iv. 430.

† Hist. des Poiss. iv. 35.

‡ It has been stated recently, that the lateral line varies from rough to smooth, and the pectoral fin is either shorter or longer in individuals of the same species, but of different ages. But until these alleged facts are verified by repeated observations, I may be excused for doubting their accuracy.

§ Since the above was written, I have had the pleasure of receiving from Dr. Parnell his admirable "Essay on the Fishes of the Forth;" a more valuable and important work in this branch of zoology has never appeared in this or any other country. Dr. Parnell's *Cuculus* differs from the *Pini*

TRIGLA aspera. Viviani, Cuv. iv. Ciliated Gurnard.

At certain seasons this interesting species, very correctly described by MM. Cuvier and Valenciennes, is common in Sicily. The largest individual I ever met with, only measured five and a half inches. As the colours have not been as yet described from the life, I subjoin the following:—The head and upper parts are light cinereous red, variegated or mottled with darker and brighter red; the pectoral fins, externally, are quite white, with a few red spots near the base; internally, they are light cinereous blue, with transverse bands of reddish brown; the sides of the body are silvery, with a tinge of yellow; the under parts pure white. The snout is shaped something like that of *T. Lyra*, being formed of two broad projecting toothed plates.

TRIGLA Sicula. Sicilian Gurnard.

Lateral line smooth; pectoral and ventral of equal length, and reaching only to the vent; body banded with raised lines on the upper half of the sides; about twelve raised tubercles, disposed longitudinally from the pectoral spine to the vent.

Inhabits Sicily.

This species (for such I must now consider it), being merely noticed in my MSS. as a probable variety of *Pini*, is not fully described in all the particulars of its structure, so that the number of the fin rays are unfortunately omitted. From a sketch, however, which was made at the time from a fresh specimen, it appears that the first dorsal fin is rather higher than in *T. Pini*; the vent is immediately under the commencement of the second dorsal, while the pectoral is not longer than the ventral fin; the upper caudal lobe seems to be the longest; the elevated transverse lines on the body are simple, and the furcation of the lateral line on the caudal is very distinct; and this fin is quite as long as the pectoral, whereas in *Pini* it is scarcely half the length. The colour of the pectorals, in these two species, are also very different. In *Pini*, as before described, both the outer and the inner surface are the same at their upper half; viz. of a uniform dark blackish brown, the rays pale; while their lower or basal half is reddish. In *Sicula*, on the contrary, the two surfaces materially differ; the outer has a greyish ground, with reddish transverse bands; while the inner surface is brown, with the rays and margin red. All the scales are small and rough to the touch, but the lateral line, although elevated, has no prickles. A comparison of the specific characters here assigned to each, will render any further observations, in this place, unnecessary. It is by no means rare on the coast of Palermo in January, and many specimens were examined, none of which exceeded 6 inches. Its general colour and structure, in all other respects, seems to have been similar to that of *Pini*, as no further differences were noted at the time.

in several particulars; it has, for instance, four spines, instead of two, in front of each orbit; the second dorsal fin ends, in *Pini*, over the *last ray but one* of the anal, and the first dorsal spine is not serrated externally in *Cuculus*, as in the true *Pini*.

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